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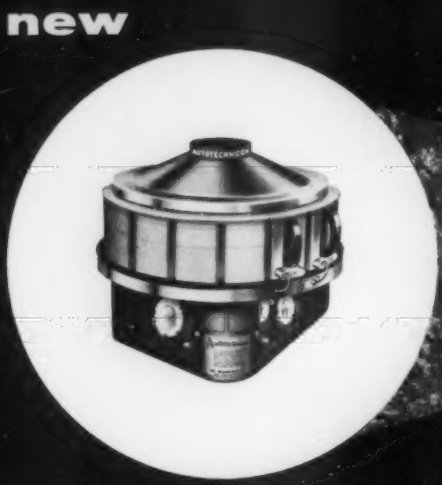

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Program of the Gordon Research Conferences, AAAS, 13 June–2 September, 1955

W. George Parks, Director
University of Rhode Island, Kingston

THE Gordon Research Conferences, sponsored by the American Association for the Advancement of Science, for 1955, will be held from 13 June to 2 Sept. at Colby Junior College, New London, N.H.; New Hampton School, New Hampton, N.H.; and Kimball Union Academy, Meriden, N.H.

Purpose. The conferences were established to stimulate research in universities, research foundations, and industrial laboratories. This purpose is achieved by an informal type of meeting consisting of scheduled lectures and discussion groups. Sufficient time is available to stimulate informal discussions among the members of the conferences. Meetings are held in the morning and in the evening, Monday through Friday, with the exception of Friday evening. The afternoons are available for recreation, reading, resting, or participation in discussion groups as the individual desires. This type of meeting is a valuable means of disseminating information and ideas that otherwise would not be realized through the normal channels of publication and scientific meetings. In addition, scientists in related fields become acquainted, and valuable associations are formed that often result in collaboration and cooperative efforts between different laboratories.

It is hoped that each conference will extend the frontiers of science by fostering a free and informal exchange of ideas among persons actively interested in the subjects under discussion. The purpose of the program is not to review the known fields of chemistry but primarily to bring experts up to date on the latest developments, to analyze the significance of these developments, and to provoke suggestions concerning the underlying theories and profitable methods of approach for making new progress.

In order to protect individual rights and to promote discussion, it is an established requirement of each conference that all information presented is not to be used without specific authorization of the individual making the contribution, whether in formal presentation or in discussion. Scientific publications are not prepared as emanating from the conferences.

Registration and reservations. Individuals interested in attending the conferences are requested to send their applications to the director on or before 15 May 1955. Each applicant must state the institution or company with which he is associated and the type of work in which he is interested. Attendance at each conference is limited to 100.

The director will submit the names of those requesting attendance to the Conference Committee for each conference. This committee will review the names and select the members in an effort to distribute the attendance as widely as possible among the various institutions and laboratories represented. A registration card will be mailed to those selected as soon as possible. Advance registration by mail for each conference is required, and registration is completed on receipt of the card and a deposit of $25 made payable to the Gordon Research Conferences, AAAS. The deposit of $25 will cover the registration fee of $20 (except for academic individuals and students on personal expense who may apply for a reduction of $10), the balance to be credited against subsistence expenses.

The room rates are as follows: $2.50 per night per person in a double room with single beds; $3 per night per person in a single room; $3.50 per night per person in a single or double room with private bath (the number of rooms available with bath is limited; assignments are made in the order that applications are received). Meals served in the dining room are at the rate of $6.50 per day per person. Gratuities are provided for by an additional charge of 10 percent, which is added to each bill. Members attending a conference are expected to live at the conference location because the conferences are organized to provide a place for scientists to get together both formally and informally. It is to the advantage of all participants to attend a conference for the entire week. If special circumstances warrant living elsewhere, all individuals, including academic members, are required to pay a special registration fee of $25.

Accommodations are available for a limited number of women to attend each conference, also for wives who wish to accompany their husbands. All such requests should be made at the time of the request for attendance, because these limited accommodations will be assigned in the order that specific requests are received. Children under 12 years of age cannot be accommodated. Dogs or other animals will not be permitted in the dormitories.

Special fund. A special fund is put at the disposal of the chairman of each conference by the Management Committee to assist scientists from academic and government institutions who cannot attend or participate because of financial limitations. This fund is provided with the object of increasing the partici-

pation of research workers of academic and government laboratories; it is limited to scientists who have been invited by the chairman to attend a conference in order to present a paper or because it is expected that they will make significant contributions during their stay at the conference. The money is to be used as an assistance fund only and may be used to contribute toward the traveling and/or subsistence expenses at the conference. Total travel and subsistence expenses normally will not be available.

Cancellations. The notice of cancellation must be received in the office of the director three weeks prior to the conference. If such notice is received 3 weeks in advance of the conference, $20 will be refunded from the $25 deposit. No refund will be made for cancellations received within the 3-week period.

Requests for attendance at the conferences, or for any additional information, should be addressed to W. George Parks, Director, Department of Chemistry, University of Rhode Island, Kingston, R. I. From 10 June to 2 Sept. 1955, mail should be addressed to Colby Junior College, New London, N. H.

Program at Colby Junior College

SEPARATION AND PURIFICATION

Arthur Rose, *chairman*; H. G. Cassidy, *vice chairman*

13 June: Vincent Verplanck, "Comparison of separation processes"; Robert V. Kleinschmidt, "Controlled thermal gradients as a factor in fractional distillation columns"; A. J. P. Martin, "Gas partition chromatography."

14 June: Kenneth Savard, "Paper chromatography of steroids"; Robert M. Milton, "Molecular sieve adsorbents"; Wayne Keller, "Preparation of pure metals in high vacuum."

15 June: John E. Powers and C. R. Wilke, "Liquid thermal diffusion"; E. S. Perry, "Separation factors in molecular distillation."

16 June: F. H. Horne, "Purification by zone melting"; A. E. Schubert, "Separation of gases in a vortex tube"; N. C. Melchior, "Metabolic mechanisms for the movement of inorganic ions."

17 June: G. J. Pierotti, "Factors affecting deviations from ideality in nonelectrolytic solutions."

PETROLEUM

R. F. Marschner, *chairman*; J. S. Ball, *vice chairman*

20 June: Robbin C. Anderson, "Nucleation and formation of carbon from hydrocarbons"; R. O. Grisdale, "Formation and properties of black carbon."

21 June, Symposium on chemistry of neutral compounds of nitrogen, oxygen, and sulfur: Calvin A. VanderWerf, "Neutral compounds of nitrogen"; Richard H. Wiley, "Neutral compounds of oxygen"; Dean Stanley Tarbell, "Neutral compounds of sulfur."

22 June: J. B. Beverly and Robert F. Marschner, "Relations among properties of liquids"; Robert Simha, "Application of liquid-state theory to hydrocarbons."

23 June: Francis P. Shepard, "Genesis of petroleum"; R. E. Kallio, "Hydrocarbons and life."

24 June: A. F. Benning and W. B. McCormack, "A comparison of fluorocarbons and hydrocarbons."

CATALYSIS

F. G. Ciapetta, *chairman*; H. H. Voge, *vice chairman*

27 June: T. J. Gray, "Defect structure and catalysis"; P. A. Marshall, Jr., "The electronic properties of solids and catalytic effects of surfaces"; Y. L. Sandler, "The magnetic parahydrogen conversion on defect solid surfaces"; P. Delahay, "Heat of adsorption of hydrogen on metals and hydrogen overvoltage."

28 June: R. E. Cunningham, "Catalytic reaction studies on plane faces of metal single crystals"; H. Pines, "The specificity of a nickel hydrogenation catalyst"; P. W. Selwood, "Magnetic studies of supported nickel catalysts"; G. C. A. Schuit, "Texture, structure and activity of nickel on silica catalysts."

29 June: H. E. Farnsworth, "Adsorption and surface catalysis using radiotracer and high-vacuum techniques"; M. E. Wadsworth, "Application of infrared spectroscopy to catalysis"; R. P. Eischens, S. A. Francis, W. A. Pliskin, "Effect of surface coverage on infrared spectra of adsorbed carbon monoxide."

30 June: E. W. Muller, "Field emission spectroscopy"; R. Klein, "The carbon-oxygen reaction on tungsten"; J. A. Becker, "Impact of modern techniques on the theories of adsorption."

1 July: A. Clark, G. C. Bailey, V. C. F. Holm, "A study of supported nickel oxide polymerization catalysts"; S. Weller and L. Wright, "The catalytic activity of barium and calcium hydrides."

POLYMERS

R. F. Boyer, *chairman*; C. G. Overberger, *vice chairman*

4 July, Recent progress in polymer chemistry: Giffin D. Jones, "Some unusual polar monomers and their polymers"; L. A. Wall, "Thermal stability of polymers at elevated temperatures."

5 July: D. S. Ballantine, "Polymerization induced by radiation"; A. A. Miller, "Effects of radiation on polymers"; F. H. Winslow and W. O. Baker, "Odd electrons and electrical conductivity in polymer molecules."

6 July: A. R. Shultz, "Thermodynamic studies of polymer solutions"; H. G. Morawetz, "Molecular association in high polymers"; Arthur Tobolsky, "Structure and mechanical properties of polymers."

7 July: S. W. Hawkins, "Some considerations of the structural factors affecting the properties of polyethylene"; C. A. Sperati, "Mechanical properties and structure of polytetrafluoroethylene"; John D. Cotman, G. L. Claver, Margaret Polglase, "Studies on the polymerization of vinyl chloride and the structure of polyvinyl chloride."

8 July: Herbert A. Newey, "The cure of epoxy resins."

TEXTILES

J. B. Goldberg, *chairman*; G. R. Seidel, *vice chairman*

11 July: H. Wakeham, "Cotton fiber properties in relation to processing and product quality"; C. Harmon and S. Simon, "Bleachability and the bleaching of off-colored cotton."

12 July: J. Compton, "The chemical modification of cotton by cyanoethylation"; E. Abrams, "A copper process for permanent microbiological protection of cellulosic fabrics."

13 July: R. G. Scott, "Fiber characterization by electron microscopy"; S. Edelstein, "Some new aspects on static in textiles."

14 July: J. S. Gillespie, Jr., "Progress in man-made protein fibers"; H. K. Hughes, "The influence of molecular structure on cellulose acetate fiber properties."

15 July: S. J. Kennedy, "Protection afforded by textiles and clothing against the thermal effects of atomic weapons."

Corrosion

E. A. Gulbransen, *chairman*;
J. J. Harwood, *vice chairman*
Fundamental studies in oxidation and corrosion

18 July, A. Gwathmey, *chairman*, *Theory and nature of surfaces*: R. D. Heidenreich, "Application of electron instrumental methods to the study of metal surfaces"; J. S. Koehler, "Structural defects produced by cold work and their possible influence on chemical reactions"; N. Cabrera, "The nature of a metal surface as suggested by theories of crystal growth"; Open discussion, "The nature of a metal surface on an atomic scale."

19 July, J. J. Harwood, *chairman*, *Substructure in oxidation and corrosion*: E. Machlin, "Recent concepts and observations of the structure of grain boundaries and subboundaries"; R. Bakish, "The chemistry of grains and grain boundaries"; M. Metzger, "Sub-grain boundary corrosion phenomena"; J. Benard, "Recent investigations in the field of nucleation during the oxidation of pure metals"; M. Simnad, "Influence of substructure upon electrochemical exchange, electrodeposition and oxidation of metals"; W. Harris, "Oxide substructure formed on single metal crystals."

20 July, T. Rhodin, *chairman*, *Nature and composition of oxide films*: F. Wormwell, "Recent English research on films and surface layers on metals"; T. Rhodin, "Oxygen adsorption on stainless steel"; W. Smeltzer, "Kinetics of oxide film formation on aluminum-magnesium alloys." *Electrical properties of oxides*, T. Rhodin, *organizer*; T. Gray, *chairman*: F. Morin, "Electron transfer in bulk oxides of the transition metals"; D. Vermilyea, "Electrical properties of oxide films on metals."

21 July, W. J. Moore, *chairman*, *Studies on oxidation of metals*: N. Cabrera, "Recent developments in the theory of oxidation"; W. Moore, "Diffusional mechanisms in oxidation of copper and zinc"; J. Benard, "Structural aspects in the selective oxidation of some binary alloys"; E. Birchenall, "Studies on the oxidation and sulfidation of iron"; J. Waber, "Experimental observations on the cubic law of oxidation."

22 July, D. Thomas, *chairman*, *Corrosion of zirconium and other metals*: R. Misch, "Electrical properties of oxide films on zirconium"; G. Cartledge, "Inhibition of corrosion by the pertechnatate ion"; G. Adams, Jr., subject to be announced.

Instrumentation

R. H. Osborn, *chairman*;
Donald Williamson, *vice chairman*

25 July: E. Leonard Arnoff, "Linear programming in operations research"; W. A. Wildhack and J. Stern, "Information sources for instrumentation.

26 July: D. Z. Robinson, "Applications of information theory"; Derald Stuart, "Ballistics instrumentation."

27 July: Robert R. Williamson, "Real time digital computer systems"; Donald P. Eckman, "A complete story of an integrated control system."

28 July: Robert T. Nieset, "Applications of radioisotopes to measuring"; John D. Isaacs, "Instruments for oceanography."

29 July: James D. Hardy, "Instrumentation in psychophysiology of temperature and pain sensation."

Additional papers to be presented during the week: William E. Vannah, "A mechanical-digital torque amplifier"; E. W. James, "Measuring time constants in chemical processes"; Nelson Gildersleeve, "Dielectric constant chemical analyzer"; John F. Bishop, "Application experiences with a new plant stream flow colorimeter"; Paul M. Erlandson, "An index of transducers and actuators"; J. A. Richards, "A linearly variable sensitivity control circuit for recording strain-gage instruments"; D. J. Troy, "Procedures for calibrating photometric scales"; Paul Hoell, "Special purpose computer techniques"; C. D. Morrill, "A computer for economic scheduling and control of power systems"; Truman S. Gray, "Neutron flux measuring system"; John P. Strange, "A discriminatory thermal conductivity gas analyzer"; Yasundo Takahashi, "Graphical solutions of heat-exchange problems."

Elastomers

A. M. Bueche, *chairman*; B. S. Biggs, *vice chairman*

1 Aug.: Harry L. Fisher, "Recent advances in elastomers"; J. J. Verbane, "Review of isocyanate chemistry"; N. V. Seeger, "Chemigum SL polyurethane elastomers"; J. A. Nelson, "Adiprene urethane rubber."

2 Aug.: K. E. Polmanteer and R. J. Koch, "Sulfur vulcanization of vinyl-substituted polysiloxanes"; E. G. Williams, "The effect of different backbone structures on the properties of isocyanate-linked elastomers"; R. S. Marvin, "The molecular basis of viscoelastic behavior."

3 Aug.: L. Breitman and L. A. McLeod, "Second-order transitions of polymers, plasticizers, and blends"; G. R. Taylor, "The tensile strength of elastomers"; F. R. Eirich and J. Cornell, "Attempted correlation between abrasion resistance and breaking strength of acrylic resins."

4 Aug.: D. Parkinson, A. F. Blanchard, J. W. Watson, C. H. Leigh-Dugmore, "Reinforcement: physical and chemical approaches"; F. L. Roth, G. M. Martin, R. D. Stiehler, "Behavior of rubber vulcanizates in tension"; A. M. Gessler, "Filler reinforcement of butyl rubber."

5 Aug.: P. Fram, "Reinforcement of acrylic elastomers"; F. D. Snyder, "The effect of high rates of elongation on the stress-strain properties of elastomers."

Medicinal Chemistry

Karl H. Beyer, *chairman*;
Bernard B. Brodie, *vice chairman*

8 Aug., *Chemical approach to neuropsychological disorders*: Donald B. Tower, "Biochemical approach to the problem of epilepsy"; Vittorio Erspamer, "Role of serotonin in the body"; Sidney Udenfriend, "Formation and fate of serotonin in the body"; Edward Evarts, "Production of experimental psychoses by chemical agents."

9 Aug.: Mark P. Altschule, "Neuropharmacological and clinical aspects of tranquillizing agents (reserpine and chlorpromazine)"; Bernard B. Brodie, "Biochemical and physiological relationships of serotonin, lysergic acid diethylamide and the tranquillizing agents." *Drug action*: Arnold J. Lehman, "Interpretation of animal toxicity in terms of potential toxicity in man"; Bert La Du, Jr., "Enzymatic mechanisms in drug metabolism."

10 Aug.: Adrien Albert, "Physico-chemical properties affecting drug action"; Robert D. Tschirgi, "Nature of the blood-brain barrier." *Collagen diseases; Purification and chemistry of the corticotropins*: Paul Bell, "Purification of the corticotropins"; K. S. Howard, "Degradation of β-corticotropin"; R. G. Shepherd, "Structure of β-corticotropin"; A. W. Meyer, general comments.

11 Aug.: A. C. Bratton, Jr., "Some biological and chemical aspects of inflammation." *Chemistry of meticorten and meticortelone*: E. B. Hershberg, "Meticorten"; H. Herzog, "Meticortelone"; Preston L. Perlman, "Biological properties of meticorten and meticortelone"; Maurice Pechet, "Metabolic studies and clinical effects of meticorten and meticortelone in man."

12 Aug., *Diabetes*: R. Levine, "Current concepts of

the physiological and biochemical role of insulin"; I. Arthur Mirsky, "Insulinase and its possible role in *diabetes mellitus*."

Vitamins and Metabolism

Paul L. Day, *chairman*; Karl Folkers, *vice chairman*

15 Aug.: J. A. Stekol, "Influence of vitamin B_{12} and folic acid on metabolism of methionine and choline in animals"; D. D. Woods, "Role of folic acid and B-vitamins in synthesis of methionine and serine by microorganisms"; Gerhard W. E. Plaut, "Biosynthesis of riboflavin by *Ashby gossypii*"; George M. Briggs, "Comparative requirements of small laboratory animals"; Herbert P. Sarett, "Effect of carbohydrate in powdered milk diets in nutrition of growing rat."

16 Aug.: Nevin S. Scrimshaw, "Nutritional and metabolic aspects of kwashiorkor"; Charles U. Lowe, "Nutritional and metabolic aspects of celiac disease and pancreatic fibrosis"; Charles D. May, discussion. William J. Darby, "Pellagra in the world today"; David B. Hand, "Food supply and nutrition in Formosa."

17 Aug., Symposium on chick nutrition: Edwin P. Singsen, "Vitamin E and antioxidants in poultry nutrition"; M. L. Scott, "Unidentified chick growth factors, with special reference to an unknown mineral essential"; Alvin C. Wiese, "New chick factor"; Orville G. Bentley, R. R. Johnson, T. V. Hershberger, "Ruminant digestion, as related to the *in vitro* studies with B-vitamins and fatty acids"; C. L. Comar, "Radioisotopes in nutritional studies with domestic animals."

18 Aug.: Robert F. Schilling, "Intrinsic factor and its relation to vitamin B_{12}; William L. Williams, "Purification and chemical studies on the intrinsic factor"; W. F. White and William R. Best, discussion. Gladys Emerson, "Vitamin B_6 deficiency in the monkey"; William Bean, "Induced pantothenic acid deficiency in man."

19 Aug.: Louis Pillemer, "The properdin system"; Harry Eagle, "Specific amino acid and vitamin requirements of normal and malignant cells in tissue culture"; George W. Kidder, "Review of the present knowledge of functions of thioctic acid."

Food and Nutrition

Anthony A. Albanese, *chairman*;
Robert A. Harte, *vice chairman*

22 Aug., Amino acid needs and utilization, James B. Allison, *chairman*: R. M. Leverton, "Amino acid needs of women"; K. H. Maddy, "Amino acid supplementations of animal and human diets"; N. W. Flodin, "Amino acid balance and nitrogen efficiency." *Nutrition and calorie limitations*, Henry B. Hass, *chairman*: J. R. Brobeck, "Hunger and food"; S. Lepkovsky, "Nutritional balance in reduction diets."

23 Aug., Parenteral nutrition, Harry L. Fevold, *chairman*: J. H. Roe, "Intravenous fructose and invert sugar solutions"; M. I. Grossman, "Intravenous fat emulsions"; C. O. Rice, "Postoperative parenteral nutritional needs." *Appraisals of the hazards of food additives*, Bernard F. Oser, *chairman*: N. Nelson, "Limitations of experimental approach"; J. L. Zapp, "Additives from packaging materials."

24 Aug., Food energy—yield and expenditure, Harry Spector, *chairman*: M. I. Grossman, "Estimation of caloric values of foods"; A. F. Henschel, "Energy expenditure in military tasks"; R. Passmore, "Energy expenditure in everyday life."

25 Aug., Fat utilization, Daniel Melnick, *chairman*: F. H. Mattson and L. W. Beck, "Action of pancreatic lipase on glycerides"; R. Reiser, "Role of phospholipids in fat absorption"; W. E. Cornatzer, "Cellular lipotropic mechanisms"; P. P. Swanson, "Nitrogen-sparing action of fats."

26 Aug., New developments in dehydrated foods, John H. Nair, *chairman*: D. K. Tressler, "Fruits and vegetables"; H. R. Kraybill, "Meats, eggs, and poultry."

Cancer

Jacob Furth, *chairman*; H. S. N. Greene, *vice chairman*

29 Aug., Features of the cancer cell and the cancerous state; Carcinogenesis, H. P. Rusch, P. Weiss, A. Gellhorn, *chairmen*: H. S. N. Greene and H. Stewart, "Biologic types of tumors and tumor cells"; C. Breedis, S. Meryl Rose, C. Grobstein, "Carcinogenesis in relation to regeneration and differentiation"; R. Graham, J. Graham, S. Gusberg, J. Nickson, "Cytologic expression of sensitivity to irradiation; Potentiation to radiation therapy"; F. W. Putnam and E. Osserman, "Myeloma and myeloma proteins"; L. W. Law and A. Kirschbaum, "The thymic factor in leukemogenesis."

30 Aug. and 31 Aug. (morning), Hormonal factors in origin and control of neoplasms, R. Hertz, R. Rawson, and J. Aub, *chairmen, I, Tumorigenesis*: W. Gardner, G. Biskind, G. Mueller, J. Trentin, M. Klein, "Estrogens, androgens, and gonadotropes"; G. Woolley, R. Silberberg, M. Silberberg, A. Kirschbaum, "Adrenal hormones and adrenotropes"; H. Morris, A. Grobman, H. Isler, "Thyroid and thyrotropes"; H. Moon, "Somatotropes"; H. Schlumberger and P. Steiner, "Character of pituitary tumors in parakeets." *II*: O. Pearson, R. Rawson, L. Engel, G. Mueller, W. Baker, "Endocrine control of neoplasia."

31 Aug. (evening) and 1 Sept., Immunologic phenomena related to neoplastic growth, E. Russell, M. Heidelberger, M. Chase, *chairmen*: G. Snell and M. Barrett, "Genetics of tissue compatability"; P. Gorer and T. Hauschka, "Relation between genetic and antigenetic character of cells; Alterations in virulence in relation to genetic and immunologic alterations"; E. Witebsky and B. Bjorklund, "Evidence for immunologic difference between cancer and homologous normal cells"; J. Freund and E. Kabat, "Immunologic analysis of tissue antigens; Unmasking latent potencies in autologous hosts; Adequacy of technics used"; H. C. Stoerk, "Extent and mechanism of destruction of malignant lymphocytes by guinea pig serum"; J. Syverton, "Pitfalls resulting from use of immuno-incompatible grafted tumors"; L. Brent, P. Medawar, R. Billingham, N. Kaliss, E. Sparrow, "Acquired tolerance to homografts."

2 Sept., Viruses causing leukemia and tumors, J. Enders, *chairman*: R. Ritchie and M. Gordon, "Leukemia in fish"; L. Gross and S. Stewart, "Leukemia in mice"; L. Gross and L. Law, "Salivary gland tumors"; L. Dmochowski, F. Bang, J. Bittner, "Mammary tumors"; J. Beard, R. Bryan, F. Bang, F. Duran-Reynals, "Avian tumors."

Program at New Hampton School

Ion Exchange

D. R. Lewis, *chairman*;
Henry C. Thomas, *vice chairman*

13 June: Jack Schubert, "Physical chemical applications of ion exchange"; A. Winger, "Ion-hydration numbers by ion-exchange membranes"; Oscar D. Bonner and Harry P. Gregor, "Ion-exchange equilibria."

14 June: Henry C. Thomas and K. Kraus, "Inorganic exchangers"; Melvin Cook, "Inorganic exchangers"; D.

Reichenberg, "Adsorption of nonelectrolytes by ion-exchange resins."

15 June: W. F. Graydon and George Butler, "Ion-exchange resin preparation and properties"; R. Kunin, "Ion-exchange resin stability"; Frank E. Harris, "Polyelectrolytes."

16 June: D. Reichenberg, "Ion-exchange relative affinities"; R. F. Baddour, "Kinetics of ion-exchange reactions"; Wm. Reiman III, "Analytical applications of ion exchange."

17 June: Andrew Gemant, "Ion exchange in nonaqueous media."

Coal

E. Gorin, *chairman*; H. H. Storch, *chairman-elect*

20 June, Gasification kinetics, P. C. Walker, *chairman*: P. C. Walker, "Kinetics and mechanism of graphite gasification"; S. Ergun, "A generalized correlation of the gasification of various carbons"; speaker to be announced, "Complete kinetic correlation in the gasification of char by H_2/H_2O mixtures"; R. H. Wilhelm, "Interaction of physical and chemical variables in coal gasification."

21 June, H. R. Batchelder, *chairman*: R. M. Busche, "Kinetics in the design of dilute phase gasification systems"; R. M. Busche, "Dilute phase gasification commercial experience." *Production of hi-Btu gas from coal*, Martin Elliott, *chairman*: H Benson, "Production of methane by modified Messerschmidt process"; R. Hiteschue, "Production of hi-Btu gas by hydrogenation of coal in fluidized bed"; M. Elliott, "Hi-Btu gas by dry coal hydrogenation."

22 June, Hi-Btu gas by methanation reactions: H. Linden, "Methanation reactions over nickel catalysts"; M. Greyson, "Methanation reactions using fluidized catalysts." *Fundamentals of combustion processes*, John Mitchell, *chairman*: T. F. Hurtley, "Recent British research work on combustion of solid fuels"; E. A. Gulbransen, "Fundamentals of combustion of graphite."

23 June: G. von Elbe and B. Karlowitz, "Combustion wave theory and combustion of char"; F. T. Barr, "The combustion of fluidized petroleum coke." *Problems in combustion technology*, George Creelman, *chairman*: A. R. Mumford, "Powdered fuel combustion systems"; L. S. Wilcoxon, "Cyclone burner."

24 June: John Yellott and associates, "Development of the coal-fired gas turbine."

Proteins and Nucleic Acids

Frank W. Putnam, *chairman*;
George B. Brown, *co-chairman*

27 June, Chemistry of the nucleic acid macromolecule; nucleotides and *nucleosides*: R. L. Sinsheimer, "The nucleotides obtained by degradation of deoxyribonucleic acid"; A. M. Michelson, "The chemistry of degradation products of deoxyribonucleic acids"; A. Bendich, L. F. Cavalieri, E. Volkin, discussion; Waldo E. Cohn, "Structural aspects of the ribonucleic acid molecule"; David Lipkin, "The base-catalyzed methanolysis of ribonucleic acids, A novel approach to the structure of the macromolecule"; Gerhard Schmidt and D. I. Magrath, discussion.

28 June: R. E. F. Matthews, "Nucleic acids containing unnatural bases"; Jack J. Fox, "The syntheses of pyrimidine and purine nucleosides"; Fritz Schlenk, S. H. Lipton, S. A. Morell, M. P. Gordon, S. Zamenhof, discussion. *The structure of ACTH*: C. H. Li, introductory remarks; P. H. Bell, R. G. Shepherd, R. A. Brown, A. W. Moyer, S. B. Davis, "Purification and characterization of the corticotropins"; R. G. Shepherd, P. H. Bell, S. B. Davis, A. W. Moyer, R. A. Brown, "Degradation and structure of β-corticotropin"; W. F. White and W. A. Landmann, "Studies on corticotropin A."

29 June: C. H. Li, I. I. Geschwind, J. S. Dixon, G. I. Harris, A. L. Levy, R. D. Cole, and I. D. Raacke, "α-Corticotropin-ACTH from sheep glands"; Klaus Hofmann, "Peptide synthesis in relation to degradation products of ACTH"; R. A. Brown and W. A. Landmann, discussion; Lyman C. Craig, "Fractionation and chemical structure of polypeptide antibiotics." *Structural studies on proteins*: C. H. W. Hirs, "Studies on the structure of ribonuclease"; C. B. Anfinson and R. Redfield, "Studies on the gross and fine structure of ribonuclease."

30 June: W. W. Bromer and Otto K. Behrens, "The chemical characterization of glucagon"; Frank W. Putnam, "Chemical homogeneity and end-group distribution of human serum globulins"; P. Desnuelle and M. Rovery, "The activation of chymotrypsinogen: a stepwise and limited proteolysis"; Henry Bull, Sidney Fox, H. Fraenkel-Conrat, discussion; Fred Sanger, "The structure of insulin"; Barbara Low, "X-ray crystal structure studies of insulin"; W. A. Schroeder and Robert Parrish, discussion.

1 July: H. Fraenkel-Conrat, "Chemical studies on tobacco mosaic virus"; W. A. Schroeder, "Structural studies on silk fibroin"; Milton Levy, "Sequence of amino acids in silk fibroin"; T. D. Kroner, discussion.

Radiation Chemistry

E. J. Hart, *chairman*; R. L. Platzman, *vice chairman*

4 July, Primary processes, I, R. L. Platzman, *chairman*: U. Fano, "Energy loss by ionizing radiations"; H. Linschitz, "Energy absorption by electronic excitation." *Primary processes, II*, M. Burton, *chairman*: D. P. Stevenson, "Electron impact phenomena in gases"; W. P. Jesse, "Ion pair yields in gases."

5 July, Free radical reactions, B. de B. Darwent, *chairman*: S. N. Foner, "Detection of atoms and radicals in gases"; D. J. LeRoy, "Atomic and molecular free radical reactions." *Gas phase reactions*, S. C. Lind, *chairman*: W. A. Noyes, Jr., "Photochemistry of gases"; P. Harteck, "Radiation chemistry of gases."

6 July, Liquid phase reactions, M. Magat, *chairman*: G. R. Rollefson, "Photochemistry of liquids"; J. W. T. Spinks, "Radiation chemistry of liquids." *Aqueous solutions*, A. O. Allen, *chairman*: M. Lefort, "Present status of radiation yields." Reports on recent research.

7 July, Diffusion kinetics, W. H. Hamill, *chairman*: H. Fricke, "Aqueous solutions"; A. Chapiro, "Nonaqueous solutions." *Solid-state reactions, I*, M. Haissinsky, *chairman*: F. Hutchinson, "Irradiation of proteins." Reports on recent research.

8 July, Solid state reactions, II, M. S. Matheson, *chairman*: G. Harbottle, "Szilard-Chalmers reactions"; J. Ghormley, "Free-radical reactions in inorganic solids."

Inorganic Chemistry

Roland Ward, *chairman*; John F. Gall, *vice chairman*

11 July, Inorganic macromolecules, Eugene Rochow, chairman: R. E. Benkeser, "Organic functional groups in organosilicon compounds"; M. M. Sprung, "Structures of some siloxane polymers"; Anton B. Burg, "Boron-nitrogen polymers"; F. G. A. Stone, "Boron-phosphorus and boron arsenic polymers."

12 July: J. P. Van Wazer, "General structure theory

of condensed phosphates"; A. E. R. Westman, "Filter paper chromatographic studies of condensed phosphates"; Ulrich Strauss, "The effect of some monovalent counter ions on the behavior of long-chain phosphates"; H. Malmgren, "High molecular weight polyphosphates from the biological viewpoint."

13 July: L. C. Baker, "Heteropoly molybdates"; L. M. Mulay, "Mechanism of polymerization of some inorganic oxides." *Chemistry of the cosmos*, F. O. Rice, *chairman*: F. O. Rice, "Chemistry on Jupiter"; G. Herzberg, "Interstellar reactions."

14 July: B. Donn, "The physical and chemical properties of interstellar space." *Chemistry of the rare earths*, H. E. Kremers, *chairman*. T. Moeller, "Electrolytic behavior of some rare-earth metal salts in basic solvents"; B. Weaver, "Rare-earth separation methods used at Oak Ridge National Laboratory."

15 July: L. L. Quill, "Composition of praseodymium oxide" and "Separation of yttrium"; F. H. Spedding and J. E. Powell, "The ion-exchange method of separating adjacent rare earths by elution with ethylenediamine tetraacetic acid."

Industrial Organic Processes

A. V. Willett, *chairman*; R. W. Ivett, *vice chairman*

18 July: H. J. Taufen, "Chemistry of pentaerythritol"; E. L. McMaster, "Physical and chemical factors in the preparation and use of ion exchange resins"; D. J. Beaver, "Organic rubber accelerators."

19 July: M. P. Cava, "Some new aromatic systems related to biphenylene"; R. W. Thoma, "Fermentation processes for production of steroids"; F. W. Tanner, Jr., "Industrial organic syntheses by microorganisms."

20 July: O. L. Davis and H. Sello, "Manufacture of tertiary butyl benzoic acid"; R. M. Zielinski, "Reaction kinetics in the production of benzene from cycloaliphatics"; Speaker to be announced, "Reactions of formaldehyde with olefins"; Hugh Campbell, "Furan derivatives."

21 July: J. E. Troyan, "Manufacture of hydrazine and substituted hydrazine"; J. F. Brown, Jr., "Organic reactions of nitrogen oxides and nitric acid"; H. E. Schroeder, "Development of dyes for new fibers."

22 July: A. D. F. Toy, "Mechanism of organic phosphorus esterification reactions"; John G. Wallace, "Hydrogen peroxide-resin expoxidation reactions."

Chemistry and Physics of Metals-Atom Movements

L. S. Darken, *chairman*; R. Smoluchowski, *vice chairman*

25 July: R. E. Hoffman, "Self-diffusion in dilute binary solid solutions'; R. F. Balluffi, "The Kirkendall effect"; N. H. Nachtrieb, "Self-diffusion in crystalline solids and in liquids"; D. Lazarus, "Diffusion in noble metals"; C. E. Birchenall, "The effect of dissolved carbon on the self-diffusion of iron in gamma-iron."

26 July: R. E. Ogilvie, "Analysis of diffusion couples by x-ray absorption"; A. S. Nowick, "Study of atomic mobility by anelastic methods"; G. Schoeck, "Interaction of dislocations and interstitials"; D. Turnbull, "Role of dislocations and grain boundaries in precipitation phenomena"; J. H. Koehler, "The quenching-in of vacancies in pure gold."

27 July: E. S. Machlin, "On the driving force for atom movements during recrystallization." W. C. Winegard, "Segregation of solute to metal surfaces"; *Round-table discussion of phenomenology of irreversible processes*, Howard Reiss, *chairman*.

28 July: Bruce Chalmers, "Crystal growth from the melt"; K. A. Jackson, "Solid-liquid equilibria in two component systems"; W. G. Pfann, "Transport of solutes by zone melting"; N. Cabrera, "Recent developments in crystal growth"; Amos Shaler, "Sintering"; M. T. Simnad, "Self-diffusion and vapor nucleation."

29 July: H. Reiss, "The influence of holes and electrons on the heterogeneous equilibria and motions of impurities in semiconductors"; G. J. Dienes and G. H. Vineyard, "Kinetics of order-disorder transformations."

Microbiological Deterioration

R. E. Vicklind and James G. Horsfall, *co-chairmen*; G. L. McNew and P. B. Marsh, *co-vice chairmen*

1 Aug.: R. H. Wellman, "Opportunities for progress in the prevention of microbiological deterioration." Martin Rubin, *chairman*: Martin Rubin, "Chelation as a fungitoxic mechanism"; S. Chabarek, "Physical and chemical highlight of chelation"; F. Rieders, "Biological action of chelating compounds"; R. Kraus, "Metal requirements of microorganisms"; M. Manowitz, "Hypotheses of fungitoxic action of chelating agents"; D. Barnes, "Mechanism studies with radioisotopes."

2 Aug., R. A. Ludwig, *chairman*: R. A. Ludwig, "Mechanisms of action of organic sulfur fungicides"; G. D. Thorn, "Structure of organic sulphur fungicides in relation to their reactivity"; G. J. M. van der Kirk, "Fungitoxic action of dithiocarbamates and related compounds"; Frances Brown, "Microbiological activity of rhodanine derivatives"; D. Jorgeson, "Dithio-compounds as fungicides"; H. D. Sisler, "Effect of organic sulphur fungicides on certain metabolic systems and enzymes"; R. G. Owens, "Known and theoretical effects of organic sulphur compounds on enzyme systems."

3 Aug., J. G. Horsfall, *chairman*: J. G. Horsfall, "Other fungitoxic mechanisms"; J. G. Horsfall, "Physical toxicity"; F. F. Nord, "Structure and action of naphthoquinone and related compounds"; H. P. Treffers, "Facts and speculation on mechanism of drug resistance"; "Factors affecting the retention of biocides by materials to which they are applied"; Program to be announced.

4 Aug., R. G. H. Siu, *chairman*: R. G. H. Sui, "Service life of present-day fungicidal treatments"; John Rutzler, "Principles of adhesion"; speaker to be announced, "Service life of agricultural fungicides"; A. M. Kaplan, "Service life of fungicides in plastics and leather"; speaker to be announced, "Service life of fungicides in wood." J. M. Leonard, *chairman*: J. M. Leonard, "Basic considerations in methodology"; W. S. Connor, "Application of statistics to laboratory testing"; E. G. Klarmann, "Assay methods—pure chemicals."

5 Aug., Speaker to be announced, "Evaluation of wood preservatives"; Allen McQuade, "Philosophy of specification testing."

Analytic Chemistry

H. A. Frediani, *chairman*; W. D. Cooke, *vice chairman*

8 Aug.: H. M. N. H. Irving, "The relationship between reagent sensitivity, stereochemistry and electronic structure"; H. H. Strain, "Electrochromatography."

9 Aug.: B. Dubrow, "The determination of particle size"; F. W. Jensen, "High frequency and microwave titrations."

10 Aug.: C. Ricciuti, "Functional group analysis by polarography"; A. Von Grosse, "The determination of oxygen."

11 Aug.: J. S. Fritz, "Theory of nonaqueous titra-

tions"; J. Riddick, "Application of nonaqueous titrimetry." Open session for nonscheduled problems.

12 Aug.: A. A. Benedetti-Pichler, "Chemical microscopy."

Organic Coatings

Louis A. Melsheimer, *chairman*;
Harry Burrell, *vice chairman*

15 Aug.: Walter O. Lundberg, "Some recent aspects of oxidation and oxidative polymerization in drying oil films"; Ernest Mueller, "Effect of driers on chemical compositions and film properties of linseed oil and varnish films."

16 Aug.: Samuel B. Crecelius, "A study of the infrared absorption spectra of gaseous degradation products of organic films under ultraviolet irradiation"; Turner Alfrey, Jr., "Intrafilm bonding forces in relation to the composition, structure, and properties of organic coating films."

17 Aug.: W. C. Walker, "Physical chemistry of printing ink transfer"; H. W. Talen, "Mechanical properties of paint films."

18 Aug.: Mark P. Morse, "Physical properties of paint films relating to service"; Wouter Bosch, "The influence of emulsification upon stress-strain properties of dried films."

19 Aug.: Paul Klens, "Microbiological factors in film deterioration"; Allen L. Alexander, "Microbial effects on organic film properties."

Chemistry of Steroids and Related Natural Products

Josef Fried, *chairman*; James A. Moore, *vice chairman*

22 Aug.: K. Wiesner, "Chemistry of the Garrya alkaloids"; S. W. Pelletier, "Structure of atisine": S. Bergström, "Some aspects of the formation and metabolism of bile acids."

23 Aug.: H. Herzog, "Chemistry of metacortandracin and metacortandralone"; R. B. Turner, "Structure of ouabagenin"; O. Wintersteiner, "Some aspects of jervine and veratramine chemistry."

24 Aug.: E. J. Corey, subject to be announced; G. D. Meakins, "Some aspects of the chemistry of lumisterol."

25 Aug.: R. K. Callow, "Stereochemistry of the sapogenins"; F. C. Uhle, "Structure and synthesis of solasodine and tomatidine"; E. Schlittler, "Chemistry of reserpine and related alkaloids."

26 Aug.: E. C. Kornfeld, "Synthesis of lysergic acid."

Adhesion

Frank W. Reinhart, *chairman*; D. W. Elam, vice chairman

29 Aug.: Turner Alfrey, Jr., "Magnitude of intermolecular forces and relations to strength properties"; Selby M. Skinner, "The electrostatic component of adhesion."

30 Aug.: John E. Rutzler, Jr., "Electrical properties and strength of adhesive bonds"; Speaker to be announced, "Adhesional theory of friction."

31 Aug.: Porter Erickson, "Surface treatments for glass"; John W. Vanderhoff, "Fundamental properties of polymer latices."

1 Sept.: David M. Gans, "Factors that influence adhesion of protective coatings"; A. E. H. Dietz, "Possible methods for nondestructive testing of adhesive bonds"; Speaker to be announced, "Adsorption at interfaces."

2 Sept.: Panel discussion, "Problems concerned with basic studies of adhesion."

Program at Kimball Union Academy

Blood

Herbert L. Davis, *chairman*

13 June: H. L. Davis, "Colloidal factors in blood stability." *Lipid absorption*: A. C. Frazer, "Alimentary hyperlipemia"; P. Desnuelle, "Some properties of pancreatic lipase"; H. Necheles, "Competition in intestinal absorption"; H. C. Tidwell and W. W. Burr, Jr., "Fat absorption and its measurement." *Analytic*: J. Folch, M. Lees, G. H. Sloane-Stanley, "Estimation of blood lipids"; W. M. Sperry, "A gravimetric method for determination of unmodified total lipids of serum"; J. D. Evans, J. M. Waldron, N. L. Oleksyshyn, R. W. Riemenschneider, "Polyunsaturated fatty acids of normal human blood"; C. Entenman, "The composition of serum lipoproteins"; T. T. Tsaltas, "Preparation, purification, and determination of lipids of serum lipoproteins after starch electrophoresis"; O. A. Schjeide, "Lipoproteins during embryonic development."

14–15 June, Lipid forms, properties, stabilities: M. I. Grossman and D. Devor, "Electrophoresis of chylomicrons"; E. Revici, "Lipids in blood physiology"; D. B. Zilversmit, "Molecular aggregation as a determinant of the metabolic fate of blood lipids"; J. Bjorksten, "Lipid deposition *in vitro* and on protein surfaces"; R. L. Swank, "Influence of fat intake on blood viscosity (with movie)"; J. M. Waldron, "The stabilizing effect of oral sucrose"; R. S. Gordon, Jr. and A. Cherkes, "Albumin-fatty acid complex in lipid transport"; H. Sobotka, "Complex formation of serum albumin with fatty acids"; M. Stefanini, "Platelet agglutination as a colloidal phenomenon"; M. Silver, D. L. Turner, R. T. Carroll, L. M. Tocantins, "Lipid antithromboplastin"; E. Sheppard and I. S. Wright, "Electrostatic forces in blood coagulation"; J. J. Spitzer, "Hemorrhagic lipemia"; L. Levine, D. L. Kauffman, R. K. Brown, "The antigenic similarity of human low-density lipoproteins"; H. D. Anderson, "The role of lipids in the preparation and use of human blood and its derivatives"; H. A. Eder, "Lipoprotein metabolism studied with C^{14}-glycine."

15–16 June, Pathological aspects: E. D. Korn "Lipoprotein lipase (clearing factor) and fat transport"; W. F. Lever, "Effects of heparin on lipoproteins"; J. Herzstein, "Heparin effects in abnormal states of lipid metabolism"; P. Constantinides, "Antiatherogenic effects of heparin and of sulfated alginic acid in the rabbit"; M. M. Gertler, J. Kream, J. Hylan, B. S. Oppenheimer, "Serum phosphatidyl bases in health and disease"; O. J. Pollak, "Serum albumin and atherogenesis"; S. O. Byers, M. Friedman, R. H. Rosenman, "Origin and fate of chylomicron cholesterol"; I. D. Frantz, Jr., "Cholesterol synthesis *in vivo* and *in vitro*"; Lena A. Lewis, "Stability of serum lipoproteins"; R. H. Furman, "Lipoprotein spectrum influenced by biliary obstruction"; D. Adlersberg, "Abnormalities of lipid metabolism"; E. H. Ahrens, Jr., "Prolonged feeding of individual defined fats to human subjects; Effects on serum lipids"; M. M. Best and C. H. Duncan, "Effects of sitosterol on human blood lipids"; J. Pomeranze, "Fat tolerance studies."

17 June: Round-table discussion and summaries.

Stream Sanitation

J. Carrell Morris, *chairman*;
Clair N. Sawyer, *vice chairman*

20 June: John P. Geyer, "Hydrological factors in stream sanitation"; Ross E. McKinney, "Metabolic path-

ways in aerobic biological treatment of organic wastes."

21 June: William Bridge Cooke, "The role of fungi in biological treatment of organic wastes"; Gerald C. Gerloff, "Phosphorus and nitrogen requirement of blue-green algae in relation to the production of algal blooms in lakes."

22 June: Gerard A. Rohlich, "Removal of algal nutrients from waste waters."

23 June: Forrest Western, "Standards of control of the release of radioactive materials into streams"; Conrad P. Straub, "Treatment methods for power reactor wastes."

24 June: Clair N. Sawyer, "Recapitulation and evaluation."

Nuclear Chemistry

A. Turkevich, *chairman*; L. Yaffe, *vice chairman*

27 June: Nuclear models; Nuclear reactions at energies below 100 Mev.

28 June: Nuclear reactions induced by heavy ions; nuclear reactions in the Bev region.

29 June: Nuclear fission, I. Nuclear fission, II.

30 June: Neutrino experiments; Positronium.

1 July: Radiochemical separations and source preparations.

Solid-State Studies in Ceramics

V. D. Frechette, *chairman*; J. R. Johnson, *vice chairman*

4 July: Wilhelm Jost, "Recent diffusion studies"; Philip L. Walker, "Chemical aspects of graphite"; S. Mrozowski, "Physical aspects of graphite."

5 July: T. J. Gray, "Defect structures and chemical reactions involving ceramics"; T. S. Shevlin, "Cermets"; E. M. Onitsch-Modl, "Sintering behavior, microstructure, and properties of metal-oxide cermets"; J. E. Burke, "Note on the sintering process."

6 July: Herbert Insley, "Isomorphous substitutions in ceramic materials"; G. T. Kohman, "Observations on hydrothermal synthesis"; R. M. Barrer, "Ion exchange in crystals as a solid-state reaction."

7 July: M. L. Kronberg, "Plastic deformation of single crystals of synthetic sapphire"; Charles Tucker, "Radiation effects in crystalline materials"; I. B. Cutler, "Infrared spectroscopy of minerals as an indication of structure"; B. E. Warren, "Review of x-ray studies of glass structures."

8 July: Hans Thurnauer, "Status of titanate developments"; Richard R. West, "High-temperature reactions in kaolin-type clays."

Chemistry and Physics of Isotopes

Malcolm Dole, *chairman*;
Harry G. Thode, *vice chairman*

11 July, Experimental methods of isotopic analysis; Determination of isotope masses, Harry Duckworth, *chairman*: A. O. C. Nier, "Mass spectrographic determination of atomic masses"; S. Geschwind, "Determination of atomic masses by microwave spectroscopy"; D. M. Van Patter, "Atomic masses from reactions of transmutation." *Determination of the relative abundance of isotopes,* Russell Baldock, *chairman*: Russell Baldock, "The present status of isotope abundance measurements"; F. A. White, "Isotopic abundance measurements utilizing a two-stage magnetic analyzer"; J. R. Sites, "Isotopic abundance measurements of the platinum metals"; C. M. Stevens, "The grid collector in surface ionization isotopic analysis."

12 July, Production of enriched stable isotopes; Electromagnetic methods, C. P. Keim, *chairman*: C. P. Keim, "The status of electromagnetic isotope separations"; C. E. Normand, "The electromagnetic isotope separation facilities at Oak Ridge"; L. O. Love, "Electromagnetic isotope separation techniques and developments"; Boyd Weaver, "The role of chemistry in the electromagnetic separation of isotopes"; P. S. Baker, "The utilization of electromagnetically enriched isotopes." *Thermal diffusion methods,* W. W. Watson, *chairman*: Lars Onsager, "Thoughts on various methods of separation by diffusion and thermal diffusion"; Philip Abelson, "Separation by the liquid thermal diffusion method"; K. Clusius and E. Schumacher, subject to be announced; W. W. Watson, "Increasing the efficiency of gaseous thermal diffusion separation columns."

13 July, Isotope effects in reaction kinetics, W. H. Stevens, *chairman*: J. C. Polanyi, "The relative rates of isotopic reactions between methyl and hydrogen"; M. Wolfsberg, "A semi-empirical study of the H_2Cl transition complex through the use of hydrogen isotope effects"; P. E. Yankwich, "Comparison of the isotope effects in the decomposition of a carboxylic acid and its ion"; P. Riesz, "Influence of temperature and solvent on the intermolecular isotope effect in the decarboxylation of trinitrobenzoate ion." Jacob Bigeleisen, *chairman*: J. Bigeleisen, "Statistical mechanics of isotopic systems with small quantum corrections"; G. Ropp, "C^{14} fractionation studies of several oxidation reactions"; R. E. Weston, Jr., "Effect of pressure on the isotope effect in a unimolecular gas reaction."

14 July, Isotopes in geochemistry and geophysics, Harmon Craig, *chairman*: Harmon Craig, "Isotopic geochemistry of water and carbon"; Robert Clayton, "Fractionation of oxygen isotopes in igneous, metamorphic, and hydrothermal rocks"; W. Dansgaard, "Studies of some meteorological oxygen isotope effects." Irving Friedman, *chairman*: Frank Senftle, "Diffusion separation of isotopes in nature"; Irving Friedman, "Deuterium fractionation in natural processes"; H. G. Thode, "Sulfur fractionation in natural processes."

15 July, Isotopic effects in oxidation reactions, R. B. Bernstein, *chairman*: R. A. Ogg, Jr., "Elucidation of mechanism of ozone pyrolysis by tracer methods"; R. B. Bernstein, "Oxygen-18 isotope effect in the reaction of oxygen with copper"; Malcolmn Dole, "Fractionation of oxygen isotopes in the formation of metal oxide films and in respiration."

Chemistry at Interfaces

A. C. Zettlemoyer, *chairman*;
W. M. Bright, *vice chairman*

18 July, Physical adsorption. J. A. Morrison, "Properties of solid surfaces"; M. L. Corrin, "Physical adsorption at low coverages"; L. E. Copeland, "Current developments in the thermodynamics of adsorption"; S. Brunauer, "Adsorption studies of Portland cement compositions."

19 July, Chemisorption, D. Graham, *chairman*: D. A. Dowden, "Chemisorption and valency"; R. P. Eischens, "Infrared spectra of chemisorbed molecules"; R. Gomer, "Some studies in absorption and catalysis with the field emission microscope"; H. E. Farnsworth, "Adsorption of gases on surfaces cleaned by ion bombardment and annealing, as determined by low-energy electron diffraction"; N. Hackerman, "Sorption on metal surfaces from solutions and from gases."

20 July, Solid-liquid interfaces, C. G. Dodd, *chairman*:

H. Van Olphen, "Interlayer and particle interaction forces in clay suspensions"; N. Hackerman, "Heats of wetting"; R. S. Hansen, "Adsorption from binary liquid solutions"; C. S. Smith, "Solid liquid interfaces in polycrystalline materials."

21 July, Liquid-liquid interfaces, W. M. Bright, *chairman*: V. K. LaMer, "Rates of evaporation through monolayers"; I. Reich, "A general theory of micelle formation"; K. J. Mysels, "Properties of solutions of surfactant."

22 July, Glass and resin surfaces, J. M. Lambert, *chairman*: J. M. Lambert, "The physical chemistry of glass-water interfaces"; G. A. Perley, "Glass structure as related to *p*H measurements"; K. S. Spiegler, "Electrochemistry of ion-exchange resins."

Plant Biochemistry and Agriculture

J. van Overbeek, *chairman*;
A. S. Crafts, *vice chairman*

25 July, Biochemistry of the soil, R. H. Burris, *chairman*: Firman E. Bear, "Chemistry of the soil"; M. B. Russell, "Soil physics"; Charles E. Kellogg, "Plant and soil interactions in soil formation"; A. G. Norman, "Soil microbiology"; Alvin Nason, "The mechanism of nitrate reduction"; R. H. Burris, "Biological nitrogen fixation."

26 July, Biochemistry of plant nutrition, T. C. Broyer, *chairman*: D. W. Thorne, "Functional role of zinc in plant nutrition." J. C. Brown, "Agricultural implications of copper"; B. Mackler, "Functional role of molybdenum in biology"; E. F. Wallihan, "Iron nutrition of trees"; R. H. Hageman, "Manganese-activated enzyme systems"; G. R. Noggle, "Boron and carbohydrate metabolism"; T. C. Broyer, "Chlorine as a micronutrient element."

27 July, Biochemistry of the action of biocides, G. L. McNew, *chairman*: A. S. Crafts, "Relationship of phloem structure to the translocation of chemicals"; W. H. Minshall, "Movement of plant biocides through plant tissues"; S. Rich and J. G. Horsfall, "Lipoid solubilization in biocides"; L. P. Miller and S. E. A. McCallan, "Uptake of fungicides and competition for receptor sites in spores"; H. N. Moorefield, "The biochemical basis of acquired resistance for insecticides"; R. D. Metcalf, "Effect of organic phosphate insecticides on cell functions."

28 July, Biochemistry and physiology of plant growth, J. van Overbeek, *chairman*: R. H. Wetmore, "Physiology and biochemistry of vegetative growth"; J. P. Nitsch, "Physiology and biochemistry of fruit growth"; S. A. Gordon, "Synthesis and destruction of auxin in the plant"; J. van Overbeek, "Molecular requirements for auxin activity." *The economical basis for agriculture,* Raymond E. Crist, *chairman.*

29 July, Energy transfer in plants, B. Axelrod, *chairman*: B. Axelrod, "The relative importance of oxidative glycolysis and the Emden-Meyerhof pathway in plants"; R. S. Bandurski, "Phosphate bond energy in carbon dioxide fixation"; A. A. Benson, "Quantum requirement of photosynthesis"; A. W. Frenkel, "Some aspects of light metabolism in cell-free preparations of purple bacteria"; P. K. Stumpf, "Oxidative systems and fat metabolism in higher plants."

Chemistry, Physiology and Structure of Bones and Teeth

W. F. Neuman, *chairman*;
R. F. Sognnaes, *vice chairman*

1 Aug., Structure of collagen, F. O. Schmitt, *chairman.* R. Robinson, *chairman*: A. Engstrom, "Ultrastructure of bone."

2 Aug., Nature and elaboration of ground substance, D. Dziewiatkowski, *chairman.* J. Arnold, *chairman*: P. Lacroix, "Histology of the matrix."

3 Aug.: A. Sobel, *chairman*: A. Carlsson, "Dynamics of skeletal calcium." C. Comar, *chairman*: G. Bauer, "Dynamics of elements other than calcium."

4 Aug.: R. Greep, *chairman*: A. H. Gordon, "The hormones of the parathyroid." B. Kramer, *chairman*: Parathyroid disease.

5 Aug., Influences other than parathyroid, E. Shorr, *chairman.*

Statistics in Chemistry and Chemical Engineering

G. H. Symonds, *chairman*

8 Aug.: E. P. King, "Fundamentals—randomization, identification of nonrandom effects, search for and evaluation of parameters"; C. Bennett, "Economy in experimental design."

9 Aug.: R. J. Monroe, "Fundamentals of regression analysis"; H. F. Smith, "Handling the multiple regression."

10 Aug.: C. Daniel, "Exploration of response surfaces"; R. J. Hader, "Exploitation of response surfaces."

11 Aug.: M. Sobel, "Statistical decision theory"; R. Bechhofer, "Multiple comparisons and decisions."

12 Aug.: M. Woodbury, "Computing techniques panel."

Glass

F. C. Flint, *chairman*

15 Aug., Structure of noncrystalline condensed phases, I, F. C. Flint, *chairman*: W. A. Weyl, "New concepts of glass structure"; J. R. Van Wazer, "The polymer theory of glass structure"; E. Plumat, "Electron configuration in structural interpretation of some glass properties"; I. Sawai, "Current Japanese concepts of glass structure."

16 Aug., Structure of noncrystalline condensed phases, II, N. J. Kreidl, *chairman*: S. W. Barber, "Structural significance of low T heat capacity data for silica"; H. T. Smyth, "Theory of viscous flow in glasses"; J. W. Mitchener, "Concepts of glass structure based on physical properties and electron micrographs"; W. J. Kauzman, "The frozen equilibrium theory of the vitreous state."

17 Aug., Transformation phenomena (2nd order transition), O. L. Anderson, *chairman*: H. R. Lillie, "Transition phenomena in glass"; N. M. Brandt, "Some French views of transition phenomena"; T. G. Fox, Jr., "The continuous transition in glass polymers"; A. V. Tobolsky, "The glassy transition in polymers."

18 Aug., Sonic and pressure effects on glass structure, H. R. Lillie, *chairman*: T. H. Litovitz, "The use of ultrasonics in the investigation of glass structure"; D. A. Stewart, "Supersonic effects on glass structure"; I. Simon, "Irreversible density changes of glass under high pressure"; O. L. Anderson, "Reversible density changes of glass under high pressure."

19 Aug.: E. U. Condon, résumé and conclusions.

High-Pressure Research and Techniques

A. M. J. F. Michels, *chairman*

22 Aug.: A. M. J. F. Michels, J. Cox, S. R. deGroot, "What contribution can high-pressure research be expected to add to our scientific knowledge"; J. Strijland, "Measuring techniques for laboratory use."

23 Aug.: R. Bird, "Equilibrium properties and molecular action with elevated pressures"; W. H. Howe, "High-pressure measuring technique for industrial use and plant control."

24 Aug.: Speaker to be announced, "Optical and electrical properties"; speaker to be announced, "Application of fundamental data on plant design."

25 Aug.: J. O. Hirschfelder and R. W. Zwanzig, "Transport phenomena under pressure"; speaker to be announced, "Design and construction in industrial high-pressure processes."

26 Aug.: Henry Margenau and E. W. Montroll, conference summary and discussion of future research.

FATS AND OILS

Daniel Swern, *chairman*;
D. H. Wheeler, *vice chairman*

29 Aug.: R. T. O'Connor, "Infrared spectroscopy"; H. J. Dutton, "Countercurrent distribution"; E. S. Lutton, "Glyceride composition of fats"; R. W. Riemenschneider, discussion; Erich Baer, "Phosphatide synthesis."

30 Aug.: R. O. Feuge, "Dibasic acid glycerides"; L. A. Goldblatt, discussion; W. J. Gensler, "Synthesis of fatty acids"; D. H. Wheeler, "Isomerization of fatty acids"; W. D. Celmer, "Chemistry of mycomycin and related acetylenic compounds."

31 Aug.: Klaus Hofmann, "Lipids from microorganisms"; Guido V. Marinetti, "Lipids of brain and nerve tissue"; W. C. Ault, "Significance of chemical purity in fatty materials for biological investigations"; Hans Kaunitz, "Abnormal effects of autoxidatively treated fats."

1 Sept.: R. T. Holman, "Essential fatty acids in nutrition"; H. C. Tidwell, "Absorption of fats"; Sidney Weinhouse, "Biochemical breakdown and synthesis of fatty acids"; J. W. Gofman, "Role of fats and lipids in heart disease."

2 Sept.: R. P. Geyer, "Intravenous feeding of fat emulsions"; E. W. Crampton and R. H. Common, "Abnormal effects of thermally treated fats."

Contribution of "a Simple Bacteriologist" to Humanity

WITH the death of Sir Alexander Fleming, there passed from our midst one of the most colorful figures in the field of science. Although Fleming made many important contributions to our knowledge of disease-producing microorganisms and the natural defenses of the human body, his name will be forever associated with the discovery of one of the greatest weapons for combating infectious disease that has come out of the laboratory—penicillin.

Born on 6 August 1881, in Ayrshire, Scotland, the youngest of eight children, Fleming spent his first years on his father's farm. He received his early schooling in the immediate neighborhood, where "he took easily to his lessons." Later he joined his brother, Thomas, who had set up a medical practice in London. It was his brother who encouraged him, in 1901, to take up medicine. By a fortunate coincidence, he selected St. Mary's at about the same time that Dr. Almroth Wright, the famous pathologist, joined that school as a teacher of bacteriology.

Fleming won the senior entrance scholarship in natural science. His "formidable memory" and "instinctive sense of observation" greatly impressed his fellow-students. He was always at the top of the examination lists. As a medical student he fell under the immediate influence of Wright, whose classical work on vaccine therapy was influenced greatly by Metchnikov's ideas on phagocytosis. After qualifying in medicine in 1906, Fleming joined Wright's laboratory, on "the quest beyond the ranges." Here he was to combine his laboratory skill with the knowledge gained from his constant contact with the sick.

Fleming was an indefatigable worker, his physical resources being a great asset to him. Within less than 2 years, he was the author or joint author of two papers on opsonin and vaccine therapy. The subject of vaccination occupied his attention during the next 5 years. He was one of the first, in 1911, to study the effect on syphilis of the recently discovered salvarsan. He was profoundly impressed by the dramatic action of this drug as compared with the leisurely effect of vaccine therapy.

The experiences he gained as a medical officer during World War I directed his particular attention to the limitations of the chemical antiseptics commonly used at that time in the treatment of septic wounds. Following Wright's lead, Fleming demonstrated the ability of leucocytes to destroy bacteria, both in the pus of a wound and on a plate heavily infected with staphylococci or streptococci. Since leucocytes are more sensitive to chemical antiseptics than are bacteria, the logical conclusion was that such agents would destroy the tissues before killing the bacteria. These experiments convinced him that "probably the most important antibacterial agents in the body are the cells themselves."

In a paper presented in 1922 before the Royal Society, "On a remarkable bacteriolytic element found in tissues and secretions," Fleming drew attention to the presence in the tissues of a substance having properties "akin to those of ferments," which he called *lysozyme*. This substance was found to have a lytic effect on certain bacteria. Lysozyme was found in tears, nasal mucus, egg white, and leucocytes. These investigations enabled Fleming to develop the procedures that he so successfully employed 6 years later in his studies on penicillin. What is now known as the cross-streak method for screening antibiotic-producing organisms can be traced directly to Fleming's method of assaying lysozyme. He attributed great importance to this agent in the natural immunity of natural defenses of the body.

The groundwork was thus prepared for the dis-

covery of penicillin. This happened when Fleming's attention was drawn to a staphylococcus culture undergoing lysis around a contaminating colony of a green *Penicillium*. The dictum of Pasteur that "chance favors only the prepared mind" has not been applied with greater accuracy than to this observation of Fleming's. This story has been told many times and need not be dwelt upon here. It is important to mention, however, that it was Fleming who subcultured the *Penicillium* and tested the effect of the broth upon different bacteria. He demonstrated the formation of a diffusible antibacterial substance (penicillin) that possessed a selective action against bacteria. Fleming also made the first comparisons of various mold cultures for their ability to produce penicillin and found this ability to be characteristic of only one particular group of molds.

Fleming further established that penicillin had no injurious effect on leucocytes and was not toxic to animals. This led him to suggest that penicillin might find application in the treatment of diseases caused by sensitive organisms. In fact, he used the active broth for the treatment of septic wounds. This led him to predict that "penicillin would one day come into its own as a therapeutic agent."

True, Roberts in 1874, Tyndall in 1876, Duchesne in 1897, Gratia in 1925, and many others in those intervening years had observed that green molds belonging to the *Penicillium* group were able to produce chemical substances that could prevent bacterial growth and even dissolve bacterial cells. But most of these observers did not have the background to appreciate the significance of these phenomena. None labored so arduously or understood so well the natural defenses of the body as did Fleming. None was so well prepared to take advantage of this observation as was Fleming by his previous studies on lysozyme.

Unfortunately, Fleming did not have at his disposal the necessary chemical assistance or the help of a large group of collaborators. It remained, therefore, for the team of Florey and Chain, 10 years later, to bring about the isolation and purification of penicillin and to demonstrate its potentialities as a chemotherapeutic agent. It is generally conceded that the Nobel Prize Committee reached a fair decision in linking the names of Florey and Chain with that of Fleming in making its award in 1945. A certain degree of credit for the development of penicillin should also be given to several American Government and university laboratories as well as to the pharmaceutical industry, with its excellent teams of chemists and bacteriologists, pharmacologists, and engineers.

As one of his biographers emphasized, Fleming possessed curiosity, insight, ingenuity, and persistence. He had the natural curiosity of a scientist, the insight required for successful experimentation, the ingenuity needed to enable him to develop the methods necessary to solve a problem, and the persistence to carry his study through to a successful conclusion.

In spite of the adulation of the public and the honors constantly showered upon him, Fleming remained modest in his claims; he was just "a simple bacteriologist," as he put it. Asking nothing in return, he gave to the world one of the greatest discoveries that has ever fallen to the hand of man to bestow. Because of his discovery, the world has become a better and healthier place in which to live.

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New Adrenal Cortical Steroid

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It has long been known that extracts of the adrenal cortex possessed activity that, in some respects, far exceeded that of the known adrenal steroids. Although attempts to isolate the substance(s) responsible for this activity were unsuccessful for more than 20 years, much was learned of the properties of the "amorphous fraction" in which it remained (*1*) after the six known biologically active steroids had been removed.

This fraction had little effect on carbohydrate metabolism or on prolonged muscle work performance and did not produce appreciable atrophy of the adrenal cortex or involution of the thymus (*2, 3*). It was highly active, however, in tests of survival and of maintenance of the growth and well-being of adrenalectomized animals. The weight, the clinical state, and the serum electrolytes of adrenalectomized dogs could be maintained with daily doses of 1 to 2 μg/kg. Although it thus resembled desoxycorticosterone (DOC) in its properties, it differed from DOC in possessing far greater activity by weight and in its failure to depress the serum potassium even when given in large doses (*3*).

In 1951 Tait, Simpson, and Grundy (4) subjected adrenal cortical extract to paper chromatography and assayed the material eluted from serial sections of the paper for its activity in depressing the Na^{24}/K^{42} ratio in the urine of suitably prepared adrenalectomized rats. They found that the region occupied by cortisone possessed a high degree of activity that was clearly not caused by the cortisone itself.

In succeeding studies (*5*) the separation of the

active component from cortisone was achieved (*6, 7*), and a substance with the same characteristics was found in adrenal venous blood (*8*). The crystallization of the substance from adrenal extract was achieved almost simultaneously in Switzerland (*9*), England (*10*), and the United States (*6, 11*). Analytical, biological, and clinical work was begun with the small amounts of available material.

A dual structure was demonstrated (*12*), 18-aldo corticosterone (3,20-diketo-11, 21-dihydroxy-Δ^4-pregnene-18-al) and the 11-hemiacetal thereof, and the name aldosterone was suggested.

Preliminary data indicate that aldosterone is about 30 times as active as DOC in producing sodium retention in the adrenalectomized rat (*13*) and about 30 times as active as desoxycorticosterone acetate (DOCA) in maintaining sodium balances and well-being in the adrenalectomized dog (*14*) and the Addisonian patient (*15, 16*). It is about 5 times as active as DOC in increasing potassium excretion (*13*). Assays based on decreases of urinary Na/K ratio in adrenalectomized rats have given figures of 85 to 120 times the activity of DOC and DOCA. Differences in method are doubtless responsible for the lack of consistency in results.

Aldosterone resembles DOC further in having no effect upon the abnormal water excretion in the hypoadrenal state in the doses thus far used and probably no effect (one patient) in rheumatoid arthritis (*15*). It is more active than DOC but less active than cortisone in glycogen deposition (*17*) and eosinophil depression. Its activity resembles that of cortisone in the cold-stress assay (*18*). It is said to raise blood pressure and body sodium to normal in hypoadrenocorticism but not to produce abnormal increases, as does DOC, even in doses several times those required for maintenance, and not to depress the serum potassium (*14, 15*). In one respect its action is thus far unique: it was reported to decrease pigmentation in three Addisonian patients (*15, 16*).

As the evidence accumulates, it thus appears that the presence of adolsterone alone will explain all the known properties of the "amorphous fraction."

As these studies with aldosterone were being conducted, a number of workers were extracting a sodium-retaining substance from urine that appears on physical and chemical grounds to be identical with it (*19, 20, 21*). It appears in the urine of edematous patients with cardiac failure and nephrosis, of patients with cirrhosis with ascites, and of normal subjects on salt restriction; its excretion is not greatly increased by ACTH but may be increased by growth hormone (*20*).

The development of our knowledge of this newly discovered adrenal cortical steroid is an illuminating example of the rapid clarification of an area of medical interest by the coordinated efforts of chemists, physiologists, and clinicians.

Note added in proof. Since this manuscript was submitted, aldosterone has been detected in the peripheral blood of normal men (*22*), and evidence for its presence in placental tissue has been presented (*23*). It has been crystallized from the urine of a nephrotic child (*24*) and from the adrenal cortical adenoma of a patient with Cushing's syndrome (*25*). The diagnosis of "primary aldosteronism" has been applied (*26*) to a patient showing hypertension, hypokalemia, and large quantities of urinary aldosterone-like steroids, who lost all these features upon removal of an adrenal cortical adenoma (*27*). It is of interest that she had no edema. Direct evidence (*28*) also suggests that the potency ratio of aldosterone to DOC based upon potassium loss is comparable to that based on sodium retention.

Aldosterone applied locally has been reported to differ from other cortical steroids in *increasing* granulation tissue in rats (*29*); it did not produce hypertension or blood vessel or kidney damage on chronic administration, as did DOC in dosage 25 times higher (*30*). It did not inhibit the production of ACTH, as implied in its failure to reduce 17-ketosteroids (in 4 days) in a child with the adrenogenital syndrome (*31*) but did appear to inhibit its release upon cold stress in rats (*32*). It was again found ineffective in rheumatoid arthritis (*33*).

The doses thus far used in man (10 to 1000 μg a day) have never approached the doses of cortisone and hydrocortisone (10 to 200 mg a day) known to be clinically effective.

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News and Notes

Survey of Biological Abstracting

Perhaps no problem facing the individual scientist today is more defeating than the effort to cope with the flood of published scientific research, even within one's own narrow specialty. The situation offers a grave threat to the international character of science and the integration of scientific knowledge. Much more efficient and universal indexing and abstracting systems become daily more essential; yet instead we have only a multiplicity of such systems operating without coordination of plan, overlapping in great measure and at the same time leaving great areas of the literature scarcely covered at all.

In order to provide a clear conception of the present situation and to indicate the directions in which planning should proceed, a survey of biological abstracting, supported by funds from the National Science Foundation and other agencies, was conducted under a contract with *Biological Abstracts* during the period between August 1952 and January 1954. An advisory committee helped to plan the survey, and a staff of 12 persons was employed for part-time work. I served as director. In order to balance general opinion against evidence, it was decided to undertake a program of two parts: (i) a statistical analysis of the current effectiveness of biological abstracting services, and in particular of *Biological Abstracts*; and (ii) a sampling of opinion among American and foreign biologists with regard to the use, merits, defects, and desired changes in the over-all abstracting program.

The full report of the Survey of Biological Abstracting runs to 63 mimeographed pages. It is hoped that it can be reproduced in full for distribution to all who may need the detailed information. Such persons should write to the office of the American Institute of Biological Sciences, 2000 P St., NW, Washington 6, D.C. A condensed, but still much fuller report than the present notice, will appear in two installments of the *AIBS Bulletin* in the issues of January and April 1955. Inasmuch as many biologists who do not hold membership in AIBS were sent the questionnaire regarding the use of abstracting services and were asked their opinions regarding present service and desired improvements, and yet many of these persons do not see the *Bulletin*, it seems desirable to present here a brief summary of the findings and conclusions and to direct interested persons to the fuller reports.

In order to determine the actual state of current abstracting and indexing—proportion of coverage of the literature, delay in publication of abstracts and indexes, overlapping between services, and so forth—four statistical analyses were conducted. They were intended to answer the following questions: (i) What proportion of the world's biological literature is now being abstracted? (ii) In those journals stated to be covered (by a particular service), what proportion of articles published is actually abstracted, and how long is the average lag between publication of article and publication of abstract? (iii) What is the extent of overlapping between abstracting services—specifically, between *Biological Abstracts* and other individual services? (iv) What is the completeness of coverage of particular subjects by *Biological Abstracts*, in comparison with available, supposedly complete bibliographies?

From the data of the present survey, a general evaluation of the abstracting program of *Biological Abstracts*, chiefly as it was conducted in the years 1947–49, may be made. There were estimated to be about 22,000 current biological and partly biological research and review journals in the world, of which the *Abstracts* covers approximately 10 percent. Of the articles published in this 10 percent of journals, the percentage of biological articles actually abstracted varies from nearly 100 percent in some journals to as low as 30 percent in others. The proportion abstracted does not depend on the importance of the periodical in a scientific sense but instead mainly upon the American, rather than foreign, origin of the periodical and especially upon the provision to *Biological Abstracts* of authors' abstracts. The interval between publication of article and publication of abstract averages two-thirds to nine-tenths of a year for United States periodicals, depending upon whether or not authors' abstracts are supplied. For the foreign journals, it ranges from two-thirds of a year for author-abstracted British journals up to an average of nearly 1½ years for European foreign-language journals. Thus, although the lag in publication of abstracts might be somewhat reduced, the present showing is not bad, in contrast to the very poor showing made in regard to the coverage of articles.

When *Biological Abstracts* is compared with other abstracting services that cover in part the same subjects, the comparison is not unfavorable. *Chemical Abstracts* is often praised as a model abstracting service, yet the survey shows that its coverage of subjects

like chemotherapy and antibiotics, even when limited to the nonclinical and strictly experimental phases of those subjects, is no better than that of *Biological Abstracts*. Each of them covered 42 to 45 percent of the articles on the subject that were covered in the other. The same may be said of most of the other nine abstracting journals compared with the *Abstracts*. Coverage of a subject by *Biological Abstracts* is considerably better than that by some abstracting journals, for example, *Excerpta Medica*, and it is not so good as that by some others, although several of these are indexing journals rather than abstracting journals, for example, *Zoological Record* and *Bibilography of Agriculture*; or they cover a restricted field, as in the case of *Helminthological Abstracts*.

When 10 special bibliographies were checked against coverage of the same subject in *Biological Abstracts*, the weakness of the latter was most strikingly shown. Nevertheless, in those cases where it was possible to check in the reverse direction, *Biological Abstracts* was found to have up to 20 percent of items missing in the special bibliography.

In order to determine the opinions of biologists on matters of abstracting, close to 7000 questionnaires were distributed to a random selection of persons on the mailing lists of the AIBS (4851), the Federation (1000), the Society of American Bacteriologists (594), and the American Association of Economic Entomologists (500). A total of 1854 returns from the United States and Canada and about 180 from abroad was received. Because of possible bias in returns mailed in, a control was secured by obtaining as complete a census of opinion as possible by interviewing the biologists in a metropolitan area (Baltimore), a midwestern agricultural college (Oklahoma A. & M.), and several small and relatively isolated liberal arts colleges. A special survey of the opinions of biological librarians was also made. Several hundred questionnaires were distributed to foreign biologists at two international congresses in Europe, but returns from these were scanty. That there is indeed some bias in the consensus obtained from questionnaires mailed in was clear from the comparison of these with the groups subjected to a relatively complete census; for the former only 2 percent of United States returns stated that no use was made of any abstracts of the biological literature, whereas in the census groups the proportion consistently ran about 10 percent. It is thus evident that returns of questionnaires are made chiefly by those most concerned about the problem under consideration. Those more neutral or indifferent fail to reply. However, in regard to all other questions asked, the census groups agreed very closely with the comparable groups included in the returns by mail.

In general, we find that, in spite of its admitted defects, *Biological Abstracts* is overwhelmingly the leading abstracting service for biologists. This appears to be true for biologists abroad as well as for those in the United States, although a larger and more random sample of foreign biologists is needed to extend the present study. Strangely enough, users of *Biological Abstracts* in the great majority regard its breadth of coverage as satisfactory and express dissatisfaction with the promptness of appearance of the abstracts. This opinion can be only a gross misconception of the real state of affairs, as is indicated in a foregoing paragraph. Overwhelming dissatisfaction is also expressed with regard to the promptness of indexing. In other respects, most users agree that *Biological Abstracts* is reasonably satisfactory. Few biologists rely exclusively on personal copies of the *Abstracts* for use, but those who subscribe to sections seem to regard them as worth the personal cost. There is marked agreement that complete coverage of a selected list of journals, publication of abstracts within ½ year of the appearance of the original articles, and inclusion in each issue of a subject index are "essentials." To speed up the publication of abstracts, a great majority of users approves of the use of authors' abstracts; but the publication of informative abstracts, with limited coverage of journals, meets with more favor than the use exclusively of titles and references in order to secure the widest possible coverage.

The needs of the situation seem to call for four kinds of efforts, along rather obvious lines, to correct and improve existing biological abstracting programs and especially that of *Biological Abstracts*: (i) improvement in coverage to the journals on selected lists, so as to provide as nearly complete coverage of each selected journal as practicable; (ii) improvement in the promptness of publication of abstracts after the original publication of articles; (iii) improvement in promptness of publication of the indexes; and (iv) improvement of the cooperation and coordination between different abstracting services, so as to reduce duplication of effort and to secure a better combined coverage of the world literature in biology. In the April issue of the *AIBS Bulletin*, a world abstracting plan for the coordination and improvement of biological abstracting has been offered.

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Operations Research and Philosophy

One of the most characteristic features of modern science and the humanities is a common urge toward interdisciplinary cooperation. It is no longer unusual to hear of a mathematical theory of economics, a topological model for genetics, or the dependence of metaphysics upon "physicomathematical science criticising itself" (*1*). A recent conference on *Philosophy and Operations Research* further underlines an affirmation of the importance of this general principle.

Operations research, which might be looked upon as scientific method applied to action problems, is a virile

newcomer in the scientific spectrum. Born as a result of wartime necessities during World War II, it has achieved remarkable stature both in its military and its industrial applications as the means by which management can be provided with "a quantitative basis for decisions regarding the operations under their control" (*2*). It has studied the problem of improving foreign economies and minimizing traffic delays at servicing points. It has examined the effectiveness of submarines and has been responsible for a mathematical theory of value. Its concern has ranged from an analysis of machine performance to excursions in defining the over-all objectives of the organization to which it is responsible.

From its very beginning, operations research, or as it is often abbreviated, "opsearch," has been critically reflective upon itself. It has inspected its tools, which range from mathematics and physics to economics and history, for their capabilities and their limitations when applied to action problems. Opsearch has scrutinized its foundations and generated original contributions to metascience—the theories and structure of the sciences. Among these can be counted an investigation of the problem of optimization and suboptimization (*3*). This is a problem in selecting the appropriate boundaries for any investigation and the proper criterions for measurement of payoffs. A second, and more comprehensive, original scheme is a stochastic model for predictions through the use of a value theory and its associated calculus (*4*).

Operations research has proceeded to the point where its broader deliberations have become philosophic in nature. The recognition of this similarity led to the sponsorship by Johns Hopkins University of a conference on *Philosophy and Operations Research*. The sessions were organized by staff members of the Operations Research Office, a member of the Hopkins family engaged in Army opsearch. Henry Margenau (Yale) acted as chairman of the meetings in Washington, D.C., on 1–3 Nov.

The intent of the conference was to explore the ways in which philosophy and operations research might be mutually beneficial. The basis of operations research, scientific method, and model building as an axiomatic venture were examined from both viewpoints. On the final day, a sample problem—that of the morale of a nation—focused the attention of both groups on a working topic.

It soon became apparent, despite the disparity in levels of generalization familiar to the two groups, that the thesis of common interest and mutual concern was justified. It first became obvious after Ellis Johnson's (director, ORO) speech on operations research, when he was pointedly quizzed by the philosophers about the details of a celebrated research study into the growth of garden vegetables. The case in point is the study made by C. W. Thornthwaite (Johns Hopkins) in which a labor problem was transformed out of existence through a systemization of the growth of vegetables at a major farming industry (*5*). The other side of the coin emerged frequently, as when operations analysts discoursed about "P-plane experiences" and "peninsular constructs" following Margenau's presentation of "The competence and limitations of scientific method."

Edward Cushen (ORO) introduced the double-sourced rationale for the conference by emphasizing the philosophical nature of the grounds for opsearch. There is more than a superficial similarity, he suggested, between metaphysical system building and the designing of systematic models of action situations. Both activities postulate elementary constituents in its sphere of interest, and describe relational connections between these "building blocks." The predictions of the theory thus developed are then compared with experimental results, and in both cases the principle of empirical verification provides the basis for acceptance, modification, or rejection of the theory. All the important features of a philosophic system have a strikingly close counterpart in operations research, from an epistemology and a logic to an axiology and an ontology.

One of the important discoveries of the conference was a nearly universal acceptance of the technique of model building as a fruitful tool for investigation in both fields. That the axiomatic method, bold in its attempt to comprehend as many aspects of a problem as possible, formed a common denominator first appeared in Johnson's observation that opsearch "designs conceptual models of the operation itself." Nearly every speaker mused at some length about this axiomatic approach, and an entire afternoon was devoted to examining the use of models in the various disciplines. Philippe Le Corbeiller (Harvard) discoursed upon the meaning of analogy in his paper on "Mathematical models." Models he defined to be an ideal system *analogous* to the actual situation we want to analyze. Alfred Tarski (California) exemplified theory construction in "The notion of a model in contemporary logic and its applications." Charles Hartshorne (Chicago), observed that "metaphysical models" could be regarded as systematic analogies of the utmost generality. Such models, he observed, will affect behavior by imparting a sense of what is important—a sense of relative significance. Of the speakers, only Michael Scriven (Minnesota Center for the Philosophy of Science) seriously questioned the axiomatic approach.

In a presentation of the "Theory of value" for which he was primarily responsible, Nicholas Smith (ORO) set the stage for the discovery of a second important feature common to both groups—a concern for a rational value-structure. Smith observed that the term *value* is to be associated with a state of the system, as contrasted with things in themselves. The value of a thing is a derivative concept that draws its justification only in terms of its differential contribution to the value of the entire complex of circumstances in which it is found.

Smith's value theory, and its associated calculus, is a stochastic model. The values of what could be described as end-states (known as "trapped states")

must be specified. Because of the freedom allowed in the manner of the selection of trapped-state values, the model is one that could be adopted by almost any school in the philosophical spectrum. When these values have been established, and transition probabilities between all the different states have been specified, it becomes possible to calculate the value of any intermediate state in which a system may find itself.

Peter A. Bertocci (Boston University) introduced the discussion on models of national morale. Morale, he observed, is willingness to suffer frustration for what is thought to be important. It assumes strength when supported by a knowledge of both individual and national objectives. His search into "The rationale of democratic morale" led, in the final analysis, to a theistic substructure. Other models, Bertocci observed, may be adequate to provide the proper conditions for a free democracy, but a theistic model imbues the convictions of members of society with the impetus for seeking further achievement of values.

George Pettee (ORO) presented the problem of national morale as it would be likely to arise in an opsearch study. Defining morale in terms of the ratio of the performance of a social group to its capabilities of performance, he pointed out that in a cold or hot war, it becomes important to discover the expected value of this proportion. A model of morale, Pettee suggested, might not require an entire "state-of-the-system" structure. A simpler and perhaps equally adequate approach might well be one that dealt directly with differential morale—the changes over periods of time.

Throughout the sessions, the discussions precipitated by the speakers were remarkable in many dimensions—comprehensiveness, intensity, volume, and especially in the excitement of new discovery.

W. EDWARD CUSHEN
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Science News

On 12 Apr., Thomas Francis, Jr., director of the Poliomyelitis Vaccine Research Center at the University of Michigan, reported on the **effectiveness of the Salk vaccine.** Data were obtained from two types of study areas: observed study areas and placebo study areas. In 127 observed study areas in 33 states, vaccine was administered to 221,998 second-grade children in a study population of 1,080,680 children in the first three grades. In 84 placebo study areas in 11 states, the study population was 749,236 children in the first three grades; 200,745 of this population received vaccine and 201,229 received placebo. The report states:

> . . . If the results from the observed study areas are employed the vaccine could be considered to have been 60 to 80 percent effective against paralytic poliomyelitis, 60 percent against Type I poliomyelitis, and 70 to 80 percent effective against disease caused by Types II and III. There is, however, greater confidence in the results obtained from the strictly controlled and almost identical test populations of the placebo study areas.
>
> On this basis it may be suggested that vaccination was 80 to 90 percent effective against paralytic poliomyelitis; that it was 60 to 70 percent effective against disease caused by Type I virus and 90 percent or more effective against that of Type II and Type III virus. The estimate would be more secure had a larger number of cases been available.

In the total study group of 1,829,916 children, 863 cases of poliomyelitis were diagnosed. Of these, 113 occurred among vaccinated children, of which 71 developed some degree of paralysis. Among the nonvaccinated children, 750 cases occurred, of which 445 developed paralysis. Fifteen deaths occurred among nonvaccinated children and one among vaccinated children.

The report confirms the success and safety of the vaccine that was first announced by Jonas E. Salk of the University of Pittsburgh in 1953. At that time Salk reported hopeful results in preliminary investigations with a triple vaccine prepared from the three types of virus.

The report on the success of the Salk vaccine is the culmination of a long struggle with poliomyelitis, which was first described in 1789 by the British physician Michael Underwood. Modern-day research along the lines that led to the Salk vaccine perhaps began with the work of Karl Landsteiner, who showed in 1909 that the disease is caused by a virus, and who also succeeded in transmitting the disease to monkeys. Other important milestones, in addition to the founding of the Warm Springs Foundation in 1927 and the National Foundation for Infantile Paralysis in 1938, both of which have supported the research of many workers—for example, as the discovery that all known strains of the virus could be classified into three broad types—include the following: David Bodian of Johns Hopkins University and Dorothy M. Horstmann of Yale University, working independently, proved that the virus circulates briefly in the bloodstream before the symptoms of the disease appear; John F. Enders, Thomas H. Weller, and Frederick C. Robbins grew the virus in test-tube culture on monkey tissues of nonnervous origin; William M. Hammon, by means of gamma globulin, found that relatively small amounts of antibodies in the human blood could protect against paralytic poliomyelitis.

An **artificial eye,** operated by magnets that cause it to move and even twinkle as effectively as the living eye it matches, has been developed at the Veterans Administration hospital in Boston, Mass. The "magne-

tic eye" already has been implanted in more than 150 patients. The designers are Everett H. Tomb, chief of the eye, ear, nose and throat section, and Donald F. Gearhart, chief of the plastic eye and restorations clinic at the Boston VA Hospital. After 6 yr of research, Tomb and Gearhart have perfected a magnetized implant, the magnet of which is placed within clear, nonirritating plastic.

Tomb has provided the surgical technique that permits the implant to become completely buried within the eye socket and to which the muscles of the removed eye are directly attached. Wounded or once-diseased eye sockets are then allowed to heal completely over the buried implant before the artificial eye is made.

A permanent magnet is set into the artificial eye during its fabrication to match the magnet of the imbedded implant. These magnets are so aligned that the artificial eye cannot slip out of correct, normal position. The magnets provide excellent anchorage for the eye, which relieves the eyelids of the burden of carrying the weight of the artificial eye.

Silver-copper solder, with titanium hydride as a wetting agent, has been used in the development of a new method for **mounting stones in diamond tools.** In a conventional mount, as much as 90 percent of the diamond used may be buried in the tool in order to gain rigidity and prevent loss of the stone. The new mounts, which were developed by H. Tracy Hall of the General Electric Research Laboratory, permit a considerably smaller diamond to be mounted in a shallow cavity on the surface of a single-point wheel-dressing tool.

The parts are brazed by induction or radiation heating in a high-vacuum system, or in an atmosphere of nearly pure argon or hydrogen. In strength tests, a small diamond tip mounted on a microtone blade and revolved at 56,000 rev/min placed a force of about 50,000 lb/in.^{2} on the bonding area. This force was insufficient to dislodge the diamond.

The advantages claimed for the process include the following: (i) the diamond is more securely anchored to its mount; (ii) the wasted "root," which in many cases is ¾ of the volume of the entire tool point, can be eliminated; (iii) much smaller diamonds can be mounted to provide the same working surface; and (iv) heat transfer is better when a diamond is bonded to metal than when there is only a mechanical connection.

Research workers of the Canadian Department of National Defence have perfected a new **method of processing yarn** that increases the strength and durability of textiles 5 to 10 times that of ordinary material.

The new process, regarded as a major development in the manufacture of textiles, is based on a method of twisting fibers into yarn. The yarn is now being produced commercially for military use. All textile fibers such as cotton, wool, and various synthetics can be used to produce cloth by the new method. The manufactured fabrics benefit to the same degree in strength and durability regardless of the raw material used. In addition, the texture of the fabrics is soft and pleasing. Existing textile equipment can be adapted to handle the new process.

Patent applications covering the new process have been filed in Canada, the United States, and Europe in the names of H. A. Delcellier and J. V. Weinberger by the Department of National Defence.

Sharat K. Roy, chief curator of geology at Chicago Natural History Museum, left on 2 Apr. for El Salvador, where he will conduct an expedition to study **Central American volcanoes** and to collect specimens of volcanic products. He has been engaged in these studies for several years, and this year will conclude his work in El Salvador and extend his activities to volcanoes in Nicaragua. If time permits he may branch out into Guatemala and other parts of Central America.

On previous expeditions to El Salvador, Roy has climbed all the major volcanoes. He was the first explorer to mount to the summit of Izalco, the most active of Central American volcanoes. His research is expected to culminate in a more detailed report than has been available heretofore.

Direct **over-the-horizon transmission at ultra high frequencies,** without the use of relay stations, has been accomplished by scientists of Massachusetts Institute of Technology and Bell Telephone Laboratories. The system requires larger antennas and higher power than conventional microwave systems. Signals are transmitted from 10 kw transmitters and antennas 60 ft in diameter at frequencies in the lower part of the UHF band. Television has been transmitted a distance of 188 mi from Bell's Holmdel, N. J., laboratory to M.I.T.'s Round Hill Research Station near New Bedford, Mass.

Lawrence R. Hafstad, former head of the reactor development program of the Atomic Energy Commission and now director of the atomic energy division of the Chase Manhattan Bank, returned recently from a 5-wk trip through Europe and Asia. He reports that the United States has **lost the lead in the peacetime development of atomic energy** to Great Britain, which has an atomic power plant program that will provide advanced engineering knowledge. He explained that fuel costs in England are high enough for atomic fuel to compete with the conventional sources of power such as coal; whereas in this country fuel is relatively inexpensive, and the cost of building nuclear power plants, as we now know them, is too high to be economical. Nevertheless, Hafstad urged U.S. industry to build atomic plants, even though there is no profit in sight, to gain more knowledge of the field.

Radio waves from Jupiter have been detected by Bernard F. Burke and Kenneth L. Franklin of the Carnegie Institution of Washington, who described their research at the recent meeting in Princeton of the American Astronomical Society. Radio waves from

the sun and the moon have been known for years, but this sound from Jupiter is the first from another planet in the solar system. Although the radio waves come from the planet itself, it is thought that they may be caused by large-scale thunderstorms in Jupiter's atmosphere. Their pattern is entirely random, and they are heard at a frequency of 22 Mcy/sec.

Burke and Franklin reported that Jupiter's radio emission is detected only about 1 day out of 3 during the 6 min the planet crosses the narrow path of their radiotelescope in Seneca, Md. The recording antenna has the form of a large "X," each part of which is 2047 ft long. It was found that the planet's motion through the sky caused corresponding changes in the position of the radio source during a period of several months.

Experimental production of **paper from synthetic fibers** has been announced by the Du Pont Co. Tests indicate that the papers, which are made from nylon, Dacron, and Orlon, can be made commercially. The papers are stronger and far more resistant to folding than those made from wood pulp or rags, and their resistance to chemicals, moisture, molds, bacteria, and light is the same as that of the fibers from which they are made. It is suggested that the papers can be used for the manufacture of such articles as heavy-duty bags, filter papers for corrosive liquids, packaging materials for chemicals, and map and tracing papers.

Ping-Ti Ho, a historian at the University of British Columbia, Vancouver, Canada, has reported in the *American Anthropologist* that the American plants, **the peanut, the sweetpotato, and corn,** have a long history in China but were not introduced there until after America's discovery by Columbus. He presents historical evidence to settle the dispute over whether or not these plants might have been introduced through pre-Columbian contacts between America and the East.

Research on possible **uses of radioactive waste materials** is under way in Yale University's chemical engineering department under the direction of Randolph H. Bretton. These materials, which are now either buried deep in the ground, taken out and dumped into the ocean, or stored until the radiation decays, will become more plentiful as more nuclear power plants are placed in operation.

The engineers, working under an Atomic Energy Commission contract, are experimenting with the effects of gamma radiation produced by the "atomic garbage." Experiments thus far have been conducted on ethylene, acetylene, and vinyl chloride. These materials were chosen because they undergo a chain-type reaction in polymerization.

By using these three gases, engineers can determine the effects of gamma radiation on various chemical compounds. The chemicals and gases under test are placed in test tubes in contact with radiation sources, then subjected to gamma radiation as well as to pressures and high voltages. Prolonged gamma radiation polymerizes both ethylene and acetylene to a waxy powder. There is considerable industrial interest in the manufacture of polymerized ethylene, for present methods of manufacturing polyethylene require high temperature and high pressure. It is possible that gamma radiation could be used to shorten or simplify the manufacturing process. Experiments with acetylene and vinyl chloride are less direct in their application, but they do prove that gamma radiation, coupled with low or high pressure and high voltage, can produce chemical changes that are otherwise difficult to accomplish.

A new society, the **Coblentz Society,** has been formed to further all phases of infrared spectroscopy. The object of the society, which is named in honor of William W. Coblentz, retired chief of the radiometry section of the National Bureau of Standards and pioneer in infrared spectroscopy, is to foster the understanding and application of infrared spectra. It will also provide a communication center and voice for the industrial chemists, scientists, research workers, and teachers who use infrared spectroscopy as a tool.

Norman Wright of the Dow Chemical Co., Midland, Mich., has been appointed chairman. The appointment was made by the executive board of the Committee on Infrared Spectroscopy that was formed at the Ohio State Conference on Molecular Structure and Spectroscopy in Columbus in June 1954. Members of the board include Van Zandt Williams, Perkin-Elmer Corp., Norwalk, Conn., registrar; Howard Cary, Applied Physics Corp., Pasadena, Calif.; Bryce L. Crawford, Jr., school of chemistry, University of Minnesota; R. A. Oetjen of the department of physics and astronomy, Ohio State University; and E. J. Rosenbaum of the Sun Oil Co., Norwood, Pa.

The Coblentz Society will in no way compete with the existing formal societies for the analytic chemist, the physical chemist, physicist, or military specialist. It will cut across the boundaries that separate these fundamental fields and thereby provide an informal mechanism by which those who use infrared can make joint efforts on common problems.

Those interested in belonging to the Coblentz Society should address Dr. V. Z. Williams, Registrar, Perkin-Elmer Corp., Norwalk, Conn., and enclose $1 to cover the enrollment fee.

Scientists in the News

Albert Einstein, 76, internationally renowned theoretical physicist and mathematician, and professor emeritus at the Institute for Advanced Study in Princeton, N.J., died on 18 Apr. in Princeton Hospital of a rupture of the aorta.

Dean Burk, head of the cytochemistry section of the National Cancer Institute, has been elected foreign member, Max-Planck-Gesellschaft zur Förderung der Wissenschaften, with appointment to the Max-Planck-Institut für Zellphysiologie, Berlin-Dahlem.

Selman A. Waksman, Nobel prize winner and professor of microbiology and director of the Institute of Microbiology at Rutgers University, will deliver this year's Dakin memorial lecture at Adelphi College in Garden City, N.Y., on 4 May. His topic is "In search of microbes." This annual lecture was instituted in 1953 after the college received the scientific library, laboratory equipment, and memorabilia of Henry Drysdale Dakin, British-born biochemist who gained world renown for developing the life-saving solution that bears his name.

Viktor S. Vavilov, a member of the staff of the Institute of Physics of the Academy of Sciences of the U.S.S.R., has been appointed deputy secretary general of the conference on the peaceful uses of atomic energy that is to take place in Geneva next August under the sponsorship of the United Nations.

Leroy D. Vandam, for the past 4 yr assistant professor of anesthesiology in surgery at the University of Pennsylvania School of Medicine, has been appointed anesthesiologist-in-chief at Peter Bent Brigham Hospital, Boston, and associate professor of anesthesia in Harvard Medical School. Vandam has conducted research in the physiology and pharmacology of anesthetic agents.

A U.S. Army Chemical Corps certificate of achievement has been awarded posthumously to **Allan P. Colburn,** former provost of the University of Delaware. Colburn was closely associated with the Chemical Corps from 1950 until his death, and was chairman of the Chemical Corps Advisory Council. The certificate gives recognition to his far-reaching advice to guidance of and consultations with the chief chemical officer, all of which contributed measurably to the success of vital chemical corps and national defense programs.

The annual Best Paper award of the Society of Exploration Geophysicists was presented to **Ben F. Rummerfield,** vice president of Century Geophysical Corp., Tulsa, Okla., during the society's recent joint meeting with the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists in New York. The paper, entitled "Reflection quality, a fourth dimension," was selected as the outstanding contribution to the advancement of exploration geophysics published during 1954 in *Geophysics,* quarterly journal of S.E.G.

Werner Braun, medical bacteriologist and chief of the variation branch of the Chemical Corps Bacteriological Laboratories at Camp Detrick, Md., has been appointed professor of microbiology and member of the Rutgers Institute of Microbiology. He will be concerned with the study of microbial populations, and his training in medical bacteriology in relation to infectious diseases will enable the institute to enlarge its studies in epidemiology and of microbes as disease-causing agents.

Alexander Silverman, emeritus professor of chemistry at the University of Pittsburgh, has been selected to deliver the 23rd annual Edward Orton, Jr., memorial lecture of the American Ceramic Society at its convention in Cincinnati, Ohio, on 25 Apr. He will speak on "Glass through the ages."

John A. Muntz, associate professor at Western Reserve University School of Medicine, is to succeed **Arthur Knudson** as professor and chairman of the department of biochemistry at Albany Medical College of Union University. Knudson will retire on 1 July. Muntz is a specialist in carbohydrate metabolism and is also interested in the effects of uranium on cell and body function.

Recipients of two awards administered by the American Institute of Nutrition have been announced.

The Borden award of $1000 and a gold medal has been given to **Albert G. Hogan,** professor of animal nutrition at the University of Missouri, for his contributions to the study of the nutritive significance of the components of milk.

E. V. McCollum, professor emeritus of biochemistry at Johns Hopkins University, has received the $1000 Osborne and Mendel award "in recognition of his outstanding discoveries concerning vitamins and mineral nutrients, and his numerous other distinguished contributions to the science of nutrition."

P. L. DeVerter, laboratory head, Inspection Laboratory, at Humble Oil and Refining Co.'s Baytown, Tex., refinery, was awarded a citation for service on 10 Mar. by the American Petroleum Institute.

George W. Beadle, chairman of the division of biology at the California Institute of Technology and president of AAAS, delivered the Nieuwland lectures in botany at the University of Notre Dame, 30 Mar.–1 Apr. "The gene" was the general topic, and Beadle discussed it as a carrier of inheritance, as a controller of function, and as an agent of evolution. This lecture series was established in 1946 in memory of Julius A. Nieuwland, botanist and chemist.

William Christopher Stadie, John Herr Musser professor of research medicine at the University of Pennsylvania, will receive the Kober medal for 1955 during the annual meeting in May of the Association of American Physicians. The medal is awarded annually by the Kober Foundation of Georgetown University, Washington, D.C., to a member of the association who has contributed to the progress and achievement of the medical sciences or the medical profession.

The American Mathematical Society's *Notices* lists the following appointments to assistant professor: Sacramento State College, **S. P. Hughart;** Washington University, **Jack Indritz;** University of New Brunswick, **J. E. L. Peck;** McGill University, **B. A. Rattray;** Illinois Institute of Technology, **R. J. Silverman;** University of Vermont, **R. F. Smith.**

The U.S. Department of Agriculture has approved the appointment of **Paul A. Miller,** vice president of Michigan State College, as director of the agricultural extension service in Michigan. An authority on rural organization and rural health, he was a member of the President's commission on health needs of the nation in 1952.

M. J. Blish, food chemist who until his retirement in 1954 was a research executive with the International Minerals and Chemical Corp., Chicago, has been named research consultant and coordinator to head an industry research program for the Glutamate Manufacturers' Technical Committee. The membership of G.M.T.C. is limited to research and technical service representatives of U.S. producers of monosodium glutamate. An industry-wide investigative program covering all uses and applications of glutamate in foods will be accelerated under Blish's direction.

Samuel C. Kincheloe, professor of the sociology of religion at the University of Chicago, has been elected president of Tougaloo Southern Christian College in Mississippi.

Granville M. Read, chief engineer of E. I. du Pont de Nemours and Co., Inc., Wilmington, Del., has received the American Society of Mechanical Engineers medal for his "outstanding leadership in developing men and in organizing and completing projects of extraordinary national and industrial importance."

Named manager of the war construction division of Du Pont in 1941, Read supervised the erection of 54 wartime ordnance facilities built for the Government at 32 locations. At present he is responsible for the engineering and construction of the $1.3 billion Savannah River project near Aiken, S.C., which is nearing completion under contract with the Atomic Energy Commission.

Benjamin S. Mesick, scientist and engineer and until his retirement last year commanding officer of Watertown Arsenal, Watertown, Mass., has recently joined the staff of Arthur D. Little, Inc., industrial research and consulting firm of Cambridge, Mass. As a senior staff member, his chief responsibility will be to expand the company's activities in titanium fabrication, and to explore the numerous industrial uses of titanium.

Harold C. Weber, professor of chemical engineering at Massachusetts Institute of Technology, has been named chairman of the U.S. Army's Chemical Corps Advisory Council.

Norman Kirk, a staff member of the General Electric Research Laboratory, Schenectady, N.Y., since 1947, has been appointed manager of the laboratory's chemical process research section. He succeeds **A. E. Schubert,** who has been named manager of engineering for G.E.'s chemical materials department, Pittsfield, Mass.

At a dinner in honor of his return from Stockholm, **Linus C. Pauling,** Nobel laureate in chemistry, was given the first Thomas Addis memorial award of the Los Angeles Chapter, National Nephrosis Foundation. The award was made in recognition of Pauling's close association with Dr. Addis, with whom he collaborated in studies concerning the mechanism of proteinuria. Hereafter, the award will be made annually to individuals for outstanding contributions to the knowledge of kidney function, kidney anatomy, and kidney diseases.

At the 8 Apr. meeting in London of the Royal Astronomical Society, **Dirk Brouwer,** Munson professor of natural philosophy at Yale University and director of the Yale Observatory, received the society's gold medal and delivered the George Darwin lecture. He discussed "The motions of the outer planets."

Paul V. Smith, Jr., of the Esso Research and Engineering Co., Linden, N.J., has received the President's award of the American Association of Petroleum Geologists. This award is given annually to the author under 35 yr of age whose article in the association *Bulletin* of the preceding year is judged to be the most significant original contribution to petroleum geology. The winning paper this year is entitled "Studies on origin of petroleum: occurrence of hydrocarbons in recent sediments" and was published in the A.A.P.G. *Bulletin* in March 1954.

The annual Robert J. Terry lecture, established in 1938 and sponsored by Washington University School of Medicine, was given 30 Mar. by **Charles H. Danforth,** professor emeritus of anatomy at Stanford University School of Medicine. His subject was "The scope of anatomy."

A member of Washington's anatomy department from 1908 until he went to Stanford in 1922, Danforth recently was awarded a citation for "outstanding achievements" by the university at its Second Century Convocation.

Harry N. Holmes, emeritus professor of chemistry at Oberlin College and former president of the American Chemical Society, has been chosen to receive the $1000 James Flack Norris award for outstanding achievement in the teaching of chemistry. Presentation will take place on 12 May during a meeting of the Northeastern Section of the A.C.S., which sponsors the award.

J. L. Stair, retired, for many years associated with Curtis Lighting, Inc., will receive the 1955 gold medal of the Illuminating Engineering Society on 12 Sept. during the opening session of the society's annual national technical conference that is scheduled to take place in Cleveland, Ohio.

Douglas B. Vollan, assistant secretary of the Council on Medical Education and Hospitals of the American Medical Association since 1952, became dean of the faculty of the Chicago Medical School on 1 Apr.

Preston M. Kampmeyer has been named chief of the cellophane research section, film research and development department, Olin Film Division, Olin Mathieson Chemical Corp. He was formerly assistant chief of the cellophane research section in New Haven.

The University of Alabama announces the following changes in staff.

Joseph F. Volker, dean of the School of Dentistry, has been appointed director of research and graduate study.

Thomas O. Paul has been promoted to professor of ophthalmology and chairman of the department.

Elmer L. Caveny, who retired from the Naval Medical Corps after 25-yr service, has been appointed professor and chairman of the department of psychiatry. Previously he was head of the psychiatry and neurology branch of the Navy Department.

Thomas Fite Paine, Jr., formerly associate professor of bacteriology and internal medicine at the University of Michigan, has been appointed professor of microbiology and chairman of the department.

William Boyd, professor emeritus of both the University of Toronto and the University of British Columbia schools of medicine, was visiting professor of pathology for the first quarter of 1955.

Mortimer F. Sayre, professor of applied mechanics and chairman of the mechanical engineering department at Union College, will retire from active teaching this June, culminating 41 yr of service to the college. He will be succeeded by **Joseph Modrey**, professor of mechanical engineering and head of the machine design section at Brooklyn Polytechnic Institute.

Meetings

The **British Instrument Industries' Exhibition** will be held at London's Earl's Court, 28 June–9 July. More than 150 of Britain's manufacturers will display scientific and electric instruments, industrial meters, automatic controls, scientific glassware, and so forth. The organizers, F. W. Bridges & Sons, Ltd., Grand Buildings, Trafalgar Square, London W.C.2, will arrange hotel accommodations for overseas visitors. Fullest assistance will be given to foreign guests, and they will be admitted to the exhibition without charge.

A **Colloquium on Theoretical Physics in Honour of Professor P. A. M. Dirac** will be held at the National Research Council of Canada, Ottawa, 9–21 June. The program will consist of lectures by invited speakers and of contributed papers on current research topics. The following is a list of the invited speakers and their topics when known, with the number of lectures indicated in parentheses: H. A. Bethe, "Scattering and photoproduction of π mesons" (2); G. Breit, "Nucleon-nucleon scattering" (2); S. Chandrasekhar, "Problems of stability in hydrodynamics and hydromagnetics" (2), and "Turbulence in hydrodynamics and hydromagnetics" (2); P. A. M. Dirac, "Quantum electrodynamics" (4); J. R. Oppenheimer, "The description of primordial matter" (2); A. Pais, "Fundamental particle problems" (3); G. M. Volkoff, "Overhauser effect and its suggested application to nuclear alignment" (1), and "The Bohr-Mottelson theory of the nucleus" (1); W. H. Watson, topic to be announced (1); V. F. Weisskopf, "The theory of nuclear reactions" (2); G. Wentzel, π-meson-proton scattering (experiment and theory) (2).

All interested persons are welcome to participate in the colloquium, and those wishing to contribute a paper should submit an abstract. Inquiries should be addressed to Dr. T. Y. Wu, Division of Physics, National Research Council, Ottawa 2, Ontario, Canada.

The 16th annual **Biology Colloquium** will be held at Oregon State College on 30 Apr. This year's theme is "Biological systematics—specific and intraspecific categories." Ernst Mayr of the Museum of Comparative Zoology at Harvard University is leader, and other speakers on the program are Theodosius Dobzhansky, Columbia University; Harlan Lewis, University of California at Los Angeles; and Roger Stanier and R. A. Stirton, both of the University of California, Berkeley. For information, address the Sixteenth Annual Biology Colloquium, 107 Commerce Hall, Oregon State College, Corvallis.

The symposium of the **American Fern Society**, scheduled for 4 June at Mistaire Laboratories in Millburn, N.J., will be followed by a general meeting and garden tour. Among the speakers will be Edgar T. Wherry, Mrs. W. D. Diddell, Norman P. Marengo, and Clara S. Hires. Spore photomicrographs, drawings, and models will be displayed. The 3-dimensional spore will be stressed. Further information may be obtained from Clara S. Hires, Mistaire Laboratories, 152 Glen Ave., Millburn, N.J.

The **Institution of Telecommunication Engineers**, established in New Delhi, India, in late 1953, recently held its first general meeting. The annual report described the remarkable growth of the institution, which already has more than 1000 members on its rolls. Membership is drawn from various government-operated communications agencies, the three defense services, research institutes, and industry.

Run by a governing council of 24, the institution, like most professional bodies, prescribes minimum educational qualifications and experience for entry into its several categories of membership; however, direct admission into the lower categories is possible upon successful completion of an examination. A quarterly publication is planned; entitled the *Journal of the Institution of Telecommunication Engineers*, the first issue is already in press. Lectures and discussion meetings are arranged periodically at New Delhi, and similar activities are being arranged at Bombay, Calcutta, Madras, Poona, Bangalore, and Jabalpur. Further details may be obtained from the Honorary Secretary, Institution of Telecommunication Engineers, Post Box No. 481, New Delhi, India.

Society Elections

The Geological Society of America: pres. and representative to AAAS Council, Walter H. Bucher, Columbia University; sec. and representative to AAAS Council, H. R. Aldrich, 419 W. 117 St., New York 27, N.Y.; treas., J Edward Hoffmeister, University of Rochester The vice presidents are George S. Hume, Department of Mines and Technical Surveys, Ottawa, Canada; Hans G. Kugler, Trinidad Leaseholds, Ltd., Trinidad, B.W.I.; Harry S. Ladd, U.S. Geological Survey, Washington, D.C.; and George Tunell, University of California, Los Angeles.

International Association for Dental Research: pres., Paul E. Boyle, School of Dentistry, University of Pennsylvania; pres.-elect, Joseph F. Volker, School of Dentistry, University of Alabama; v. pres., Reidar F. Sognnaes, Harvard School of Dental Medicine; sec.-treas., Edward H. Hatton, professor emeritus of Northwestern University; asst. sec.-treas., Dan Y. Burrill, University of Louisville; trustee, Paul C. Kitchin, Ohio State University.

The Radiological Society of North America, Inc.: pres., Thomas B. Bond, Fort Worth, Tex.; pres.-elect, Clarence E. Hufford, Toledo, Ohio; sec.-treas., Donald S. Childs, Sr., Syracuse, N.Y.; librarian, Howard P. Doub, Detroit, Mich. The vice presidents are Howard B. Hunt, Omaha, Neb.; Charles M. Gray, Tampa, Fla.; and Sydney J. Thomas, Palo Alto, Calif. Representative to the AAAS Council is Eugene P. Pendergrass, Philadelphia, Pa.

American Anthropological Association: pres., George P. Murdock; pres.-elect, Emil W. Haury; sec., treas., and exec. sec., William S. Godfrey, Jr.

Society of Women Engineers: pres., Katharine Stinson, Civil Aeronautics Administration, Washington, D.C.; v. pres., Dot Merrill, Merrill & Co., Chicago, Ill.; cor. sec., Lois McDowell, Illinois Institute of Technology, Chicago; rec. sec., DeLoris Keister, Los Angeles, Calif.; treas., Isabelle French, Allentown, Pa.

Cushman Foundation for Foraminiferal Research: pres., Fred B. Phleger, Jr., Scripps Institution of Oceanography; v. pres., J. B. Reeside, Jr., U.S. Geological Survey; sec.-treas., Katherine V. W. Palmer, Paleontological Research Institution, 109 Dearborn Place, Ithaca, N.Y. Hans E. Thalmann, Stanford University, was reelected editor for 3 yr.

The Wildlife Society: pres., Justin W. Leonard, Michigan Department of Conservation, Lansing; v. pres., E. L. Cheatum, New York Department of Conservation, Albany; exec. sec., D. L. Leedy, U.S. Fish and Wildlife Service, Washington, D.C.; editor of *Journal of Wildlife Management*, O. H. Hewitt, Department of Conservation, Cornell University; editor of *Wildlife Society News*, Thomas R. Evans, Wildlife Management Institute, St. Paul, Minn.

The Michigan Academy of Science, Arts, and Letters: pres., Willis Dunbar, Western Michigan College; pres.-elect, Charles W. Creaser, Wayne University; v. pres., Richard A. Fennel, Michigan State College; sec., George M. McEwen, University of Michigan; treas., Volney H. Jones, University of Michigan; editor, Sheridan W. Baker, Jr., University of Michigan; librarian, Frederick H. Wagman, University of Michigan. Representative to the AAAS Council is A. M. Chickering, Albion College.

Horticultural Society of India: sec., C. S. Randhawa, Indian Agricultural Research Institute, New Delhi; treas., Romesh Chandra, Indian Agricultural Research Institute; editor, D. Chatterjee, Indian Agricultural Research Institute.

Erratum: The officers listed for the American Statistical Association in "Society Elections" for 25 Mar. were incorrectly defined. The names given were those of the officers for the association's Social Statistics Section.

Education

Harvard University has announced that the program leading to the A.M. and Ph.D. degrees in biochemistry will be expanded commencing in the fall of 1955. Qualified students interested in biochemistry will be offered a choice of applying for either of two programs of instruction: (i) the existing program administered by the department of biological chemistry at the Harvard Medical School in Boston, through the Division of Medical Sciences; and (ii) a new program administered by a committee on biochemistry, composed of certain members of the biology and chemistry departments at the University in Cambridge.

Both programs are under the jurisdiction of the Faculty of Arts and Sciences. Students enrolled in either program are free to take instruction in the other, and, where necessary, transfers will be arranged between the two. A student's choice of program will be governed largely by the relationship of his research interests to those of the faculty member concerned. When making application a student should indicate which of the two programs he wishes to enter. Further information concerning both programs can be obtained from the Graduate School of Arts and Sciences, 24 Quincy St., Cambridge 38, Mass.

Three groups of Army and Air Force veterinary officers have completed a special training **course in veterinary radiological health.** A fourth group will begin the course 31 May.

The 2-wk course, which is held at the Oak Ridge Institute of Nuclear Studies, is designed to train veterinary officers to evaluate the effects of ionizing radiation on food and food-producing animals. Under present plans, the course will be repeated at intervals until all veterinary officers of the Army and the Air Force have had an opportunity to attend. Veterinary officers have been responsible for determining the wholesomeness and quality of foods for United States

troops since World War I. The curriculum includes biological aspects of radiation phenomena, dosimetry, radiobioassay in animal tissues, radiation syndromata in domestic animals, and disposition and salvage of radiocontaminated foods. Lectures, applicatory exercises, training films, and demonstrations are the mediums used for presenting the instruction.

A recent 1-wk lecture course in x-ray diffraction, sponsored jointly by **the George Washington University School of Engineering** and **the General Electric Co.**, was attended by 78 prominent physicists. Laboratory demonstrations were conducted at the National Institutes of Health, Naval Research Laboratories, National Bureau of Standards, and Bureau of Public Roads. Chief lecturer at the course was David Harker, director of the Protein Structure Project at Brooklyn Polytechnic Institute.

Other lecturers included Charles L. Christ of the U.S. Geological Survey; Rose C. L. Mooney of the National Bureau of Standards; B. H. Warren of Massachusetts Institute of Technology; and H. S. Liebhafsky, Eileen I. Alessandrini, R. G. Edholm, and H. W. Pickett of the General Electric x-ray and research laboratories.

A $580,000 science administration building was dedicated on the **Oklahoma Baptist University** campus, Shawnee, during recent Founders' Day ceremonies. Two floors are occupied by the biology department, complete with greenhouse, museum, and laboratories, and by the physical science departments and laboratories, mathematics department, and home economics department. The first floor contains a lecture room equipped for all types of audio-visual aids and a greenhouse with darkroom for photosynthesis study.

Because of the ever-increasing interest and use of radioisotopes in medicine and pharmacy, especially in manufacturing laboratories and hospital pharmacies, the Philadelphia College of Pharmacy and Science is offering a special **course in radioisotope techniques.** For four weeks commencing 6 June, 4-hr classes will be held in the chemistry laboratories of the college three times weekly. Arthur Osol, director of the School of Chemistry, will supervise the course work, and instruction will be given by Grafton D. Chase.

The course will consider both the theoretical and the practical aspects of radioisotope techniques. It will include a study of radioactivity units and standards, radioactive decay and decay processes, instrumentation for the measurement of radioactivity, properties of radiation, statistical problems of radiation measurement, methods of radiation characteristization, standardization and calibration of radioactive samples, and problems of health physics and radiologic safety. Biological, chemical, medical, and pharmaceutical applications, as well as special techniques such as autoradiography, kinetic studies, and isotope dilution methods will also be studied. Approximately 20 experiments utilizing special techniques required in the use of isotopes will be performed in the laboratory.

Total cost of the course is $55. Graduates in pharmacy may apply to the Registrar of the Philadelphia College of Pharmacy and Science, Philadelphia 4, Pa.

The Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, has approved a grant of $27,800 to the New York State Psychiatric Institute for establishing a **mental hygiene clinic** for deaf adolescents and adults. The institute will operate in three mental health areas—research, service, and training of others to serve as mental hygiene workers for the deaf, under the directorship of Franz J. Kallman of Columbia University.

Dalmo Victor Co. of San Carlos, Calif., which is primarily known for the design, development, and manufacture of airborne-radar antennas, has become a participant in the honors cooperative program of the School of Engineering of **Stanford University.** Coordination of the program will be handled by Allen S. Dunbar.

Under the terms of the plan, four graduate students, a microwave specialist, a servomechanism engineer, a mechanical engineer, an industrial engineer, will be placed on the company payroll and given regular assignments in the engineering laboratory, except that working hours will be reduced by an amount approximately equal to the time spent in regular daytime graduate classes at Stanford.

Atlanta University offers a limited number of **graduate scholarships,** ranging from $200 to $500, to men and women eligible for graduate study in the departments of biology, chemistry, economics and business administration, education, English, French, history and prehistory, mathematics, political science, social science, sociology and anthropology, library service, and social work. Applications for the academic year 1955–1956 may be secured from the registrar of the university and should be *filed before 15 May 1955.*

Grants, Fellowships, and Awards

The **Lalor Foundation** has announced awards of up to $1100 each to 23 faculty members of American and Canadian colleges and universities for 1955 summer research and study in the biological sciences. Of these appointees, 13 stated that their plans were to carry forward their projects at their own institutions, and 10 expect to work in laboratories of other institutions. Four of the latter group will be at Brookhaven National Laboratory. The availability of these awards for the summer of 1955 was announced last October, and the present appointees have been selected from the 88 applications received.

With only two exceptions, the nominees have positions at the assistant professor and instructor levels. The average age is 31, representing an average of 4 yr out of graduate school. The youngest appointee is

25, and the oldest is 37. Publications per person average 1.1 per year since taking the bachelor's degree. The smaller colleges and universities are represented by 7 appointees; 10 appointees are located at tax-supported institutions and 13 at privately supported ones. The average salary of the group at the tax-supported institutions was $5200, as compared with $4400 at the private institutions.

Geographic distribution shows 2 appointments from the northeastern states, 8 from the Middle Atlantic states, 4 from the southern states, 4 from the central states, 2 from the Far West, and 3 from Canada.

The Marine Biological Laboratory at Woods Hole, Mass., has also announced appointment of 1 senior Lalor fellow and 6 postdoctoral Lalor fellows for the summer of 1955 at the M.B.L. under its agreement with the Lalor Foundation. It is expected that announcement will be made in October regarding the next series of awards.

The **National Science Foundation** has announced the award of 715 predoctoral graduate fellowships in natural sciences for the academic year 1955–56. Successful fellows were selected from 2931 applicants from all parts of the continental United States, Alaska, Hawaii, and Puerto Rico. Honorable mention was accorded 1409 applicants. In addition to the predoctoral fellowships awarded, the foundation also announced the names of 70 winners of postdoctoral fellowships.

Of the predoctoral fellowships, 255 awards were made to first-year graduate students, 291 awards were made to graduate students in the intermediate years, and 169 awards to terminal-year predoctoral students. Recipients include 206 persons who have been NSF fellows during the current academic year. Candidates for renewal fellowships competed on an equal basis with new applicants.

The largest group of predoctoral fellowships, 167, was awarded in chemistry. In other fields the number of awards were: physics 151, engineering sciences 107, mathematical sciences 52, biochemistry 35, zoology 50, earth sciences 30, microbiology 20, psychology 27, biophysics 8, botany 16, agriculture 14, medical sciences 11, astronomy 9, genetics 10, anthropology 5, general biology 3. Of the postdoctoral awards, 26 were made in the life sciences, 15 in chemistry, 15 in physics and astronomy, 11 in the mathematical sciences, 1 in the earth sciences, and 2 in the engineering sciences.

The **American Heart Association** has announced that 114 fellowship awards totaling $695,000 have been made to research workers in the field of heart and blood vessel diseases for studies to be conducted during the 12 mo beginning 1 July. The latest awards raise to more than $10,000,000 the amount given to support of cardiovascular research by the association and its affiliates since the association became a national voluntary health agency in 1948.

The new allocations are the first to be made from contributions by the public to the 1954 Heart Fund campaign. These fellowships represent an increase of more than a third over similar awards made last year, and they will be supplemented later this year by a second group of grants. In all, the association has set aside $1,408,502.77 from 1954 Heart Fund contributions for the national program of research support in which it participates with its affiliates. This is in accord with a Heart Association policy of allotting to research at least half of all funds available to the national office of the organization.

The National Academy of Sciences–National Research Council has awarded the first two **American Chemical Society Petroleum Research Fund** postdoctoral fellowships. These fellowships were inaugurated in 1954 by the ACS to provide advanced scientific education and fundamental research in the petroleum field.

These fellowships are open only to citizens of the United States, and the candidates are selected in nationwide competition. The awards are available in any area of pure science which in the judgment of the reviewing board may afford a basis for subsequent research directly connected with the petroleum field. As used, the term "petroleum field" embraces (i) exploration for, and the production, transportation and refining of, petroleum, petroleum products, and natural gas, and (ii) the production and refining of substitutes for petroleum and petroleum products from natural gas, coal, shale, tar sands, and like materials.

For the first time in the history of the **Damon Runyon Memorial Fund for Cancer Research,** a grant has been made to support research in a medical institution in Peru. The grant, amounting to $4000, was included in the $88,500 that was allocated in March by the Runyon Fund to institutions and research fellows in this country. The South American award went to the Universidad Nacional Mayor de San Marcos in Lima. The money will be used to assist Pablo Mori-Chavez in his investigation of the effect of high altitude on neoplastic growth.

Celanese Corporation of America has announced the establishment of 16 annual graduate followships in 15 colleges and universities for the 1955–56 academic year in its continuing program to assist in the development of adequately trained technical personnel for promising careers in industry. Nine fields of study are covered in the program, including textiles, chemistry, plastics, cellulose, chemical engineeering, organic chemistry, physics, engineering physics, and physical chemistry.

Howard L. Holley, associate professor of medicine at the University of Alabama, received a grant of $97,000 from the National Institute of Arthritis and Metabolic Diseases for a 5-yr study program of joint fluid changes in rheumatic diseases, which he will direct. Part of the grant was used to purchase an ultracentrifuge.

Award of forty-eight unclassified life science research contracts in biology, medicine, biophysics, and radiation instrumentation was announced in March by the **U.S. Atomic Energy Commission.** Eight of the 1-yr awards are for new projects: four in biology, three in the medical sciences, and one in radiation instrumentation. Of the 40 contract renewals, 20 are in biology, 16 in medical sciences, 3 in biophysical research, and 1 in radiation instrumentation.

The Ecole Nationale Supérieure de Chimie, University of Strasbourg, is offering several graduate research **scholarships in chemistry.** Applications must be submitted *before 10 Sept.* to the Cultural Services of the French Embassy, 972 Fifth Ave., New York 21.

The **Lipotropic Research Fund** of New York will receive applications for grants-in-aid for 1956 *until 1 June.* A request for application forms, which should include a short statement describing professional affiliations and experience, may be addressed to the administrative secretary, Dr. L. Lipton, 26 Vark St., Yonkers 1, N.Y.

In the Laboratories

Midwest Research Institute has announced the development of an extensive code library that will greatly enhance the speed and economy with which engineering computations can be completed in its computing laboratory and will enable the institute to offer virtual "mail-order" service. In making the announcement, Midwest noted that, although electronic calculators have enormous capabilities, the extent to which these capabilities have been employed has often been curtailed by prohibitive coding costs. A complex calculation may take only minutes to perform, but the process of coding prior to the calculation may take days, weeks, or months.

Once a code is prepared for a particular engineering problem, however, no further coding is required. Midwest's solution to the high cost of coding was to establish a code library containing the computer's instructions for a wide variety of problems in chemical, civil, electrical, and mechanical engineering. With this system, the client need pay only for the actual time spent in calculation on the calculator, plus a nominal percentage that will be credited to the development of the code library. And with each new problem completed, new codes are added to the library.

A Schmidt-type telescope that is being built in the workshops of the **Upsala Observatory** will be shipped to Australia this autumn to the **Canberra Observatory,** the largest in the southern hemisphere. The instrument has been designed by engineers E. Aulin and F. Thorlin of the Swedish AGA Co., under the supervision of Prof. Gunnar Malmquist, Upsala. The reflector has been aluminized, a process that gives better reflecting properties than the silver coating previously used. A smaller telescope of the same type has already been completed for the Upsala Observatory, and two larger units are under construction. The Canberra telescope will be used for spectral analysis of the southern celestial hemisphere in order to supplement similar observations being made in the northern hemisphere.

This year marks the 75th anniversary of **Schwarz Laboratories, Inc.** of Mount Vernon, N.Y. The organization concentrates particularly in the brewing and organic chemicals fields, and its activities include an extensive analytical and research laboratory; a consulting service; a technical training academy; the manufacture of various kinds of apparatus, brewing specialties, and chemicals; the propagation of special "pure-bred" strains of organisms with carefully guarded genealogies; and the preparation of radioactive materials.

Announcement has been made that **Societé Rhone-Poulenc** has started commercial production of a complete line of silicones in its recently completed plant at St. Fons, near Lyon, France. The $3 million plant, built on a 10-acre site, has up-to-date facilities for research and production on a large scale.

Rhone-Poulenc was the first company in France and possibly in western Europe to undertake production of silicones to meet the growing European demand. It initiated research on silicones in 1942 and was successful in continuing development work secretly during the German occupation. Following years of pilot-plant production, construction of the new plant, known as "Les Carriers," was started last summer.

The **Western Electric Co., Inc.,** has been selected by the U.S. Air Force to build the radar warning system across the Canadian Arctic. The system, the Distant Early Warning line, will extend for 3000 mi across the top of the continent. The United States will meet the full construction cost of the project, estimates for which vary from $200,000 to $1 billion. The contract is said to be a "cost, plus fixed fee" agreement. An American company and two Canadian companies will be subcontractors.

Work on a $3.5 million wind tunnel to test models of aircraft and guided missiles will be started in San Diego this year by the **Convair Division,** General Dynamics Corp., San Diego, Calif. The new trisonic tunnel was included in the budget of more than $8 million for capital expenditures that was approved recently by the corporation's board of directors. Other items of the budget include more than $1.4 million for new plant equipment and $980,000 for engineering and laboratory facilities.

The test section of the tunnel will be 4 ft^2. Test runs will average 40 sec, with data being recorded electronically. Air speed will be variable from ½ to 4½ times the speed of sound. The new facility is expected to include three spherical storage tanks capable of holding at least 20,500 ft^3 of air at a pressure of 17 atm. During tests the air will be released through a

connecting tunnel to the test section in a two-story aerodynamics laboratory building. A diffuser on the opposite side of the laboratory will channel the high-pressure air to another structure housing the muffler. Pressure in the storage tanks will be built up by a three-stage compressor system.

Other Convair facilities now being either planned or constructed are a flight-test data reduction building, a hydrodynamics model-testing basin, a fuel and oil systems laboratory, an acoustics environmental laboratory, and a high-temperature structural and propulsion laboratory.

Charles Pfizer and Co., Inc., has shipped a $20,000 consignment of antibiotics to President Ramon Magsaysay as a donation for relief of the 11,000 victims of the recent earthquake disaster in the southern Philippines.

Hazelton Laboratories, Inc., has announced the completion of a new laboratory building that provides an additional 8000 ft² of floor space for carrying out biological safety evaluation studies of chemicals, drugs, and cosmetics. One floor of the new building is used to provide quarters for some 3000 albino rats that are being used for feeding studies. In order to insure optimum conditions for the experimental animals, special precautions have been taken to guard against extreme cold or sudden changes in temperature. The temperature of the building can be held constant within ½ deg of the desired temperature, except in the extreme heat of summer.

Miscellaneous

A detailed inventory of the equipment needed to **set up a medical school** is now available as the result of a joint undertaking by the World Health Organization and the United Nations Educational, Scientific and Cultural Organization. This reference manual is the latest in a series of inventories of apparatus and materials for teaching science at all levels that was begun by UNESCO in 1949 to promote the introduction of suitable science teaching into schools of war-damaged or underdeveloped regions. Earlier volumes have dealt with the teaching of science in primary, secondary, and vocational schools; the teaching of basic sciences in the universities; veterinary sciences; the agricultural sciences; the teaching of physics and engineering; and the teaching of electrical engineering.

This new publication contains lists of equipment used in the instruction of medical students in eight subjects: anatomy, bacteriology, biochemistry, histology, pathology, pharmacology, physiology and hygiene, and public health. The material listed under each subject represents the consensus of some 20 professors from different parts of the world on the equipment needed. The lists contain rough indications of prices, and each is preceded by a short discussion of teaching methods.

Inventories of Apparatus and Materials for Teaching Science, pt. 5 (Medical Sciences) of vol. III, is available at all UNESCO sales agents at $2.75 a copy; in the United States it can be obtained from Columbia University Press, 2960 Broadway, New York 27, N.Y., and from the United Nations Bookshop.

The **American Academy of Arts and Sciences,** Boston, has announced that it will sell its headquarters at 28 Newbury St. The proceeds of the sale are to be carried in an account of the academy to be known as the Agassiz Fund, in recognition of the Agassiz family to whom the academy is indebted for the building that it has occupied since 1912. Arrangements are being made for quarters in a more suitable locality where the Agassiz name will continue to be commemorated.

To encourage the use of **humane slaughtering devices,** the Animal Welfare Institute, 350 Fifth Ave., New York 1, N.Y., needs funds to purchase humane stunning equipment for testing, distribution, and practical use. Contributions for this purpose, whether large or small, will be most welcome.

The American Museum of Natural History, New York, recently opened its new **Hall of Oil Geology,** probably one of the largest and most complete exhibits of its kind ever constructed. Norman D. Newell, Curator of Historical Geology at the museum, said:

> The exhibits are designed to interpret for the layman the natural processes whereby oil is formed, the exploratory methods employed in the search for oil fields, and the techniques used in extracting petroleum from the ground to meet the growing demands for oil.

The exhibition is the result of a cooperative effort of the museum and the Standard Oil Co., which provided technical guidance and substantial financial support. Many oil service companies also played an important part in the development of the exhibits.

The first issue of *Grana Palynologica,* edited by Gunnar Erdtman of the Palynological Laboratory, Bromma, Sweden, has appeared. This publication is for those who want to be in touch with work done on pollen and spores, including the spores of moss, ferns, and fern allies. The initial issue includes electron microscope pictures of *Lycopodium* spores as well as other features. Copies may be ordered from the publisher, Almqvist and Wiksell, 26 Gamla Brogaton, Stockholm C, Sweden, at a cost of 15 Swedish kronar (about $3) plus postage.

The research committee of the **American Sociological Society** has prepared the *1955 Census of Research,* a list of the current projects that have been reported, together with the names of the members of the society working on each project. This document consists of 67 mimeographed pages, including an index of authors. The projects are classified into 24 subject categories. Copies may be obtained for $1 each from the American Sociological Society, New York University, Washington Square, New York 3, N.Y.

New Books

Acetylenic Compounds in Organic Synthesis. R. A. Raphael. Academic Press, New York; Butterworths, London, 1955. 219 pp. $6.20.

Concise Dictionary of American Literature. Robert Fulton, Richards, Ed. Philosophical Library, New York 16, 1955. 253 pp. $5.

The Crime of Galileo. Giorgio de Santillana. Univ. of Chicago Press, Chicago, 1955. 338 pp. $5.75.

Personnel and Industrial Psychology. Edwin E. Ghiselli and Clarence W. Brown. McGraw-Hill, New York–London, ed. 2, 1955. 492 pp. $6.

Secularism Is the Will of God. An essay in the social philosophy of democracy and religion. Horace M. Kallen. Twayne, New York, 1954. 233 pp. $4.

Man Meets Dog. Konrad Z. Lorenz. Trans. by Marjorie Kerr Wilson. Houghton Mifflin, Boston, 1955. 211 pp. $3.

Philosophy and Analysis. A selection of articles published in analysis between 1933–40 and 1947–53. Margaret Macdonald, Ed. Philosophical Library, New York 16, 1954. 296 pp. $7.50.

Bibliography on Hearing. Prepared by Psycho-Acoustic Lab. Harvard Univ. Press, Cambridge, Mass., 1955. 599 pp. $7.

Geology in Engineering. John R. Schultz and Arthur B. Cleaves. Wiley, New York; Chapman & Hall, London, 1955. 592 pp. $8.75.

The Dancing Bees. An account of the life and senses of the honey bee. Karl Von Frisch. Trans. by Dora Ilse. Harcourt, Brace, New York, 1955. 183 pp. $4.

The Exploration of the Moon. Arthur C. Clarke. Harper, New York 16, 1954. 112 pp. $2.50.

Health Careers Guidebook. The Natl. Health Council, New York 19, 1955. 153 pp.

Chemisorption. B. M. W. Trapnell. Academic Press, New York; Butterworths, London, 1955. 265 pp. $6.80.

Applied Entomology. An introductory textbook of insects in their relations to man. H. T. Fernald and Harold H. Shepard. McGraw-Hill, New York–London, ed. 5, 1955. 385 pp. $7.

Higher Education in the United Kingdom. A handbook for students from overseas. Longmans, Green, London–New York, rev. ed., 1954. 168 pp. 4s.

Forbidden Lands. Gordon Cooper. Philosophical Library, New York 16, 1955. 165 pp. $4.75.

Differential and Integral Calculus. Harold Maile Bacon. McGraw-Hill, New York–London, ed. 2, 1955. 547 pp. $6.

Linearized Theory of Steady High-Speed Flow. Cambridge monograph on mechanics and applied mathematics. G. N. Ward. Cambridge Univ. Press, New York 22, 1955. 243 pp. $6.

Cells and Societies. John Tyler Bonner. Princeton Univ. Press, Princeton, N.J., 1955. 234 pp. $4.50.

Poissons. vol. IV, pt. 1, *Téléostéens acanthoptérygiens.* Résultats scientifiques, expédition océanographique Belge dans les eaux côtières Africaines de l'Atlantique Sud, 1948–1949. Max Poll. Institut Royal des Sciences Naturelles de Belgique, Brussels, 1954. 390 pp. Paper.

Soil Fertility. C. E. Millar. Wiley, New York; Chapman & Hall, London, 1955. 436 pp. $6.75.

Nuclear Physics. Irving Kaplan. Addison-Wesley, Cambridge 42, Mass., 1955. 609 pp. $10.

Down to Earth. A practical guide to archaeology. Robin Place. Philosophical Library, New York, 1955. 173 pp. $7.50.

Quantitative Analysis. Albert Frederick Daggett and William Buell Meldrum. Heath, Boston, 1955. 470 pp. $5.

Receptors and Sensory Perception. A discussion of aims, means, and results of electrophysiological research into the process of reception. Ragnar Granit. Yale Univ. Press, New Haven, 1955. 369 pp. $5.

Science and the Human Imagination. Aspects of the history and logic of physical science. Mary B. Hesse. Philosophical Library, New York, 1955. 171 pp. $3.75.

Mathematics for the Chemist. Mathematical analysis for chemists, physicists, and chemical engineers. G. J. Kynch. Academic Press, New York; Butterworths, London, 1955. 356 pp. $4.80.

Elements of Servomechanism Theory. George J. Thaler. McGraw-Hill, New York–London, 1955. 282 pp. $7.50.

Methods of Biochemical Analysis. vol. II. David Glick, Ed. Interscience, New York–London, 1955. 470 pp. $9.50.

The Prevalence of People. Marston Bates. Scribner's, New York, 1955. 283 pp. $3.95.

Analytical Cytology: Methods for Studying Cellular Form and Function. Robert C. Mellors, Ed. Blakiston Div., McGraw-Hill, New York–London, 1955. 511 pp. $15.

An Introduction to Cell and Tissue Culture. The Staff. Burgess, Minneapolis, 1955. 123 pp. Paper, $4.

A Histology of the Body Tissues with a Consideration of Their Functions. Margaret Gillison. Livingstone, Edinburgh, Scotland, 1950. 220 pp. 15s.

Doctors in the Sky. The story of the Aero Medical Association. Robert J. Benford. Thomas, Springfield, Ill., 1955. xv + 326 pp. Illus. $8.75.

Floods. William G. Hoyt and Walter B. Langbein. Princeton Univ. Press, Princeton, 1955. 469 pp. $7.50.

Foundations of Quantum Theory. A study in continuity and symmetry. Alfred Lande. Yale Univ. Press, New Haven, 1955. 106 pp. $4.

Fundamentals of Radiobiology. Z. M. Bacq and Peter Alexander. Academic Press, New York; Butterworths, London, 1955. 389 pp. $6.50.

Ion Exchange and Adsorption Agents in Medicine. The concept of intestinal bionomics. Gustav J. Martin. Little, Brown, Boston–Toronto, 1955. 333 pp. $7.50.

Plane Trigonometry. C. R. Wylie. McGraw-Hill, New York–London, 1955. 381 pp. $4.

Biochemistry and Physiology of Protozoa. vol. II. S. H. Hutner and Andre Lwoff, Eds. Academic Press, New York, 1955. 388 pp. $9.

Dairy Cattle: Selection, Feeding, and Management. William Wodin Yapp and William Barbour Nevens. Wiley, New York and Chapman & Hall, London, ed. 4, 1955. 420 pp. $4.76.

The American School in Transition. William E. Drake. Prentice-Hall, New York, 1955. 624 pp.

Rutin and Related Flavonoids. John Q. Griffith, Charles F. Krewson, and Joseph Naghski. Mack, Easton, Pa., 1955. 275 pp.

Soviet Civilization. Corliss Lamont. Philosophical Library, New York, ed. 2, 1955. 447 pp. $5.

Semimicro Qualitative Analysis. Frank J. Welcher and Richard B. Hahn. Van Nostrand, New York–London, 1955. 497 pp. College, $6.50; reference, $8.

The Colloid Chemistry of Silica and Silicates. Ralph K. Iler. Cornell Univ. Press, Ithaca, N.Y., 1955. 324 pp. $5.50.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to *Science*, but to the publisher or agency sponsoring the publication.)

Youth's Outlook on the Future. DPP15. James M. Gillespie and Gordon W. Allport. Doubleday, Garden City, N.Y., 1955. 61 pp. $0.85.

Ein Theorem uber die Feldstarke in Potentialfeldern. Hans Ertel. Akademie-Verlag, Berlin, 1954. 10 pp. DM. 1.

Early Cenozoic Vertebrates in the Red Conglomerate at Guanajuato, Mexico. Smithsonian Misc. Coll., vol. 123, No. 7. Carl Fries, Jr., Claude W. Hibbard, and David H. Dunkle. Smithsonian Institution, Washington 25, 1955. 25 pp.

A Reconsideration of the Racer, Coluber Constrictor, ***in Eastern United States.*** Zoology, vol. 2, No. 6. Walter Auffenberg. Tulane Univ., New Orleans, 1955. 155 pp. $1.

The Phenomenon of Continuous Freezing of Capillary-Held Water at Decreasing Temperatures. Bull. No. 52. Balwant Rai Puri, Lekh Raj Sharma, and M. L. Lakhanpal. Panjab Univ., Hoshiarpur, India, 1954. 6 pp. R. 15.

An Experimental Study of Eddy Transports in the Lower Atmosphere. Div. of Meteorological Physics, Tech. Paper No. 2. W. C. Swinbank. 30 pp.

The Atmospheric Fine Structure Recorder. Tech. Paper No. 3. I. C. McIlroy. 19 pp. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1955.

Study of Physical Properties in the Refining of Petroleum. Quarterly of the Colorado School of Mines, vol. 49, No. 4. George W. LeMaire. 1954. 87 pp. $2. ***Classification of Rocks.*** vol. 50, No. 1. Russell B. Travis. 1955. 98 pp. $1. Colorado School of Mines, Golden.

Color in Foods. A symposium sponsored by the Quartermaster Food and Container Institute for the Armed Forces and Quartermaster Research and Development Command, U.S. Army Quartermaster Corps. Kenneth T. Farrell, Joseph R. Wagner, Martin S. Peterson, and Gordon Mackinney, Eds. Natl. Academy of Sciences–Natl. Research Council, Washington, 1954 (Order from Quartermaster Food and Container Institute for the Armed Forces, Chicago 9). 186 pp.

Report of the Fuel Research Board. With the report of the director of fuel research for the year 1953. Dept. of Scientific and Industrial Research. Her Majesty's Stationery Office, London, 1954. 62 pp. 2s. 6d.

Some Mites of Yemen. vol. 34, No. 28. Charles D. Radford. 18 pp. $0.45. ***A New Larval Mite from Eritrea*** (Acarina: Trombiculidae). vol. 34, no. 29. Charles D. Radford. 3 pp. $0.10. Chicago Natural History Museum, Chicago 5, 1954.

Proceedings and Addresses of the American Philosophical Association, 1953–1954. vol. XXVII of the combined proceedings of the several divisions. The Association, Univ. of Wisconsin, Madison, 1954 (Order from Antioch Press, Yellow Springs, Ohio). 136 pp. $1.50.

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Technical Papers

Obesity Following Unilateral Hypothalamic Lesions in Rats

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It is well known that electrolytic lesions involving the ventromedian nuclei of the hypothalamus result in hyperphagia and obesity (*1*). This report (*2*) deals with the production of obesity by unilateral hypothalamic lesions.

Female albino rats of the Wistar stock weighing 220 to 260 g were used in these experiments. The animals were housed in separate cages placed in a room with constant temperature and regular illumination. They were fed Purina Dog Chow and water *ad libitum*. Hypothalamic lesions were produced with the Krieg stereotaxic instrument (*3*) on animals anesthetized with ether. The lesions were placed unilaterally between planes 56 and 57 (as defined by Krieg) 1 mm to the right of the midline and 0.5 to 1.00 mm superior to the sphenoid bone. The current used was 1.5 or 2 ma for 30 sec.

At autopsy the rats were decapitated, and after removal of the lower jaw and the calvarium, the heads were fixed in neutral 10 percent formalin.

After 24 hr the brains were dissected free and were cut down to blocks extending from the optic chiasm to, and including, the mammillary bodies. The ventral portion of the thalamus was included in each block as well as the piriform cortex and the amygdaloid nucleus laterally. These blocks were refixed in formalin for 24 hr and washed in tap water overnight. After dehydration they were imbedded in paraffin. Serial sections cut at 10 μ were taken of the entire block and mounted on slides. The sections were stained with eosin and methylene blue.

Twenty-nine rats received unilateral lesions on the right side. A group of 30 rats of similar ages and weights were examined for normal weight gains. On the basis of their rate of weight gain, as well as of previous experience with this stock, it was considered that operated animals could be presumed hyperphagic if they either maintained a rate of daily weight gain greater than 0.5 g for an extended period (more than 100 days) or if they exhibited a rate of daily weight gain greater than 1 g during the first 20 days postoperatively. By these criterions 13 animals were rendered hyperphagic by the operation. Of particular interest are the few rats that exhibited very marked hyperphagia. Animal No. 3 gained 71 g in 63 days; animal No. 19, 93 g in 18 days; animal No. 23, 105 g in 108 days; animal No. 24, 70 g in 108 days; animal No. 27, 108 g in 64 days. Each animal, when killed, weighed in excess of 350 g. The brains of these rats were examined histologically to determine the site and extent of the lesions. These were described according to the nomenclature introduced by Krieg (*4*).

The lesions were large and were confined to the hypothalamic nuclei on the right side of the third ventricle, except in the case of animal No. 3 in which the midline and a small part of the left arcuate nucleus ventral to the third ventricle were also involved. Although identical coordinates and strength and time of current were used, there was some variation in the extent of the lesions. However, in all five animals the ventromedian nucleus, parts of the periventricular, lateral, and the arcuate nuclei were destroyed. In one case the ventral part of the dorsal median nucleus was also involved. In three cases the lateral extent of the lesions included the caudal portion of the supraoptic nucleus, the commissure of Gudden, the commissure of Meynert, and the subfornical fibers of the median forebrain bundle. Anteriorly the lesion in two cases involved the anterior nucleus but did not include the paraventricular and suprachiasmatic nuclei or the anterior part of the supraoptic nucleus. Caudally the lesions did not embrace the mammillary nuclei. It should be noted in particular that the lesion of animal No. 19, which gained 93 g in 18 days postoperatively, was completely confined to one side of the hypothalamus.

Although the animals just described were undoubtedly hyperphagic, their weight gains were generally less than those seen in 28 comparable animals of the same stock subjected to bilateral lesions at the same time (2 ma for 15 or 30 sec); 24 became transiently or permanently hyperphagic. Steady weight gains of 6 g/day or more were seen in eight animals. One animal maintained a rate of weight gain of 9 g/day for 13 days postoperatively. One hundred days postoperative seven animals exceeded 500 g. Five more reached weights between 400 and 500 g, and three more reached weights between 350 and 400 g.

The fact that some animals with large lesions restricted to one side of the hypothalamus became obese is of interest. It seems to establish the fact that the medial centers (ventromedian nuclei), the destruction of which causes hyperphagia, are not simply each one paired with a lateral feeding center (lateral hypothalamic area) as a brake on the facilitatory eating mechanism, as is suggested by some authors (*5*). Apparently lateral feeding centers have to be bilaterally destroyed in order that anorexia prevail (*6*), whereas unilateral medial lesions may cause hyperphagia. It is, of course, not impossible that a lesion of one side could functionally involve both sides by the destruction of crossing fibers. However, it seems much more likely that two centers, bilaterally disposed, both normally act to prevent hyperphagia. The removal of either one permits the development of about half the

obesity caused by the destruction of both. In accordance with this view is the observation that the excess weight gain over normal after successful unilateral lesions was about half of that observed in successful bilateral lesions. It must be noted that in the mouse, obesity follows bilateral but not unilateral destruction of the ventromedian nucleus (*7*).

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Evidence for Echolocation in the Rat

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We wish to present evidence that rats can guide themselves in a maze by auditory cues—probably the echoes of sounds they produce.

Ten blinded rats were trained on an elevated maze (Fig. 1). On each trial, either path *L* or path *R* was blocked 20 cm from its beginning by a 15- by 15-cm metal barrier *B*. Each path was blocked on half the trials in a random sequence. A response was counted incorrect if an animal placed all four feet on the blocked alley so that its vibrissae could touch the barrier. Upon reaching the goal, the rat was allowed to eat briefly before starting the next trial.

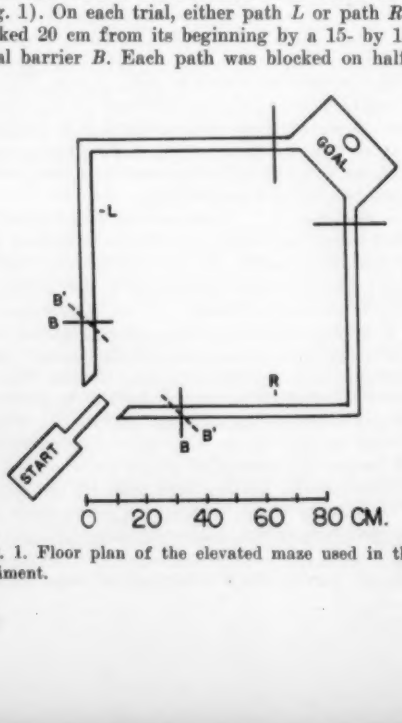

Fig. 1. Floor plan of the elevated maze used in the experiment.

The test situation was designed to prevent solution by nonauditory cues. Olfactory cues were excluded by the constant position of the food, and vibratory-tactile cues were excluded by suspending the barriers independently from the maze. Painting the barriers flat black did not alter the rats' behavior; this test thus excluded reflection of radiant energy as a cue. The orientation of the maze in the room was changed each day in order to vary possible extra-maze cues.

All the rats learned to select the correct path. Seven attained a level of 18 correct out of 20 successive trials. Two critical tests give positive evidence that the effective cue is auditory. (i) The angle of the barriers with respect to the pathways was changed from the usual 90° (*B* in Fig. 1) to 45° (*B'*). The performance of the six animals used in this test dropped to the chance level. Performance returned to normal when the barriers were again set at 90°. Presumably the performance deteriorated because sound was not reflected back to the rat but was reflected out to the side of the apparatus. (ii) Three of the animals were then tested with their ears occluded. Performance again dropped to chance.

Our initial hypothesis was that rats might guide themselves, as bats do, by the echoes of ultrasonic cries, since rats can hear sounds in the ultrasonic range (*1*) and can produce ultrasonic cries (*2*). Accordingly, we monitored their performance with a system consisting of a condenser microphone, amplifiers, and a cathode-ray oscilloscope (*3*). We were able to confirm the production of ultrasonic cries by the rats. However, these cries are given very rarely in the maze, and they do not seem to be related to maze performance.

The rat frequently does produce other sounds in the maze—it may sniff, sneeze, click its teeth, or scratch the floor, and even its footfalls are often audible to a nearby observer. On some trials the rat does not produce any sound that we can hear before making its choice, yet it performs correctly; this may indicate nothing more than our inability to hear all the noises that the rat does. Considering the present evidence, it seems likely that the rat, like the human being (*4*), can use the echoes of the incidental sounds that it produces in order to detect objects in its environment. This possibility should be considered in designing experimental situations in which the rat is to be used.

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Binding of Hydrocortisone-4-C^{14} and Progesterone-4-C^{14} to Serum Albumin, Demonstrated by Paper Electrophoresis

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Binding of steroid hormones to serum albumin has been studied in several laboratories (*1*). It was found that the maximal binding capacities of albumin solutions for various steroid hormones are in the order of 100 to 10,000 times their physiological concentrations, depending on the nature of the particular steroid concerned. It is evident, therefore, that the potential binding of serum albumin for steroid hormones exceeds by far any concentrations that may occur in the circulating blood, even under extreme conditions. The studies cited, however, do not elucidate to what extent the small quantities of steroids actually present in the blood are bound and transported by albumin, that is, to what degree the binding capacity is utilized. This paper describes experiments on systems in which serum albumin moved, under the influence of an electric field, in the presence of small concentrations of steroids.

The albumin binding was investigated with hydrocortisone, one of the most "polar" compounds known among the natural C_{21} steroids. For comparison, progesterone was selected as a substance that might be considered at the other extreme with respect to the number of polar groups. Hormones tagged with radiocarbon at C_4 were employed (*2*). The activity of the steroids used was such that it permitted determinations with about 10,000 times greater sensitivity than was possible by chemical means. No experimental procedures were applied that might effect structural changes in the steroid molecules; a measurement of the radioactivity, therefore, was equivalent to a determination of the steroid hormones studied.

A purity check of the hydrocortisone-4-C^{14} by paper chromatography showed that the hydrocortisone spot contained 94 percent of the radioactivity. Only 46 percent of the total C^{14} in the progesterone preparation was found in the progesterone peak on a paper chromatogram; rechromatography and isolation from the progesterone spot furnished material of approximately 100 percent purity.

Figure 1 represents the results obtained in a number of experiments. Figure 1 (top) shows that almost the total amount of hydrocortisone-4-C^{14} added to an albumin solution stayed at the origin. The slight cathodic migration was caused by electroosmotic movement of the buffer. Only about 2 percent of the total steroid was transported by albumin and could be demonstrated in statistically significant amounts after extraction of the comparatively large cuts II to V. In contrast, Fig. 1 (bottom) shows that the major part of progesterone-4-C^{14} was bound and transported by albumin under the same conditions of paper electrophoresis. As much as 90 percent of the total progesterone was found to have been shifted from the starting area to the anodic side. This is a minimal value, since no correction was made for the electroosmotic flow in the opposite direction, which was observed in all experiments.

Essentially the same results were obtained with solutions of hydrocortisone and progesterone in human serum and rat serum. The albumin in rat serum transported only about half as much progesterone as did human serum albumin. It may be noteworthy that the albumin in rat serum was found to have only half the azorubin-binding capacity of the albumin in human serum (*3*).

From the location of the C^{14} peaks in the paper-electrophoretic experiments, it seemed possible to conclude that adsorption of the steroids on the paper might interfere with their distribution. Therefore, the adsorptive effect of the paper on the two steroids was studied by paper chromatography in the same buffer that was used in the paper-electrophoretic experiments. It was found that, in the absence of serum

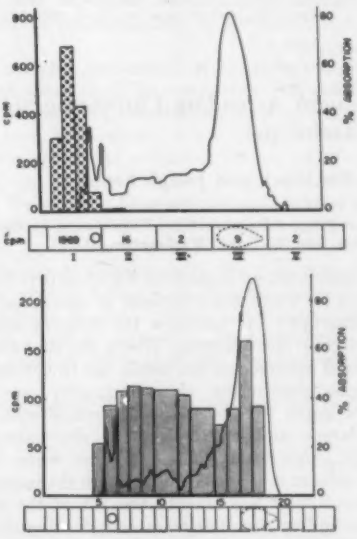

Fig. 1. Paper electrophoresis of solutions of hydrocortisone-4-C^{14} (top) and progesterone-4-C^{14} (bottom) in 4-percent human serum albumin. Concentration, about 50 μg/ml; Michaelis buffer, *p*H 8.6, $\mu = 0.05$. *Abscissae*: Paper strip with cutting lines. The Arabic numerals indicate counts per minute (cpm) for cuttings I to V (top) and the number of cuttings (bottom). The circles on cutting I (top) and on cutting 6 (bottom) represent the spot of application. Cutting IV (top) and cuttings 17 to 19 (bottom) show the albumin. *Ordinates*: Counts per minute in paper cuttings are indicated by bars. Percentage of light absorption of stained albumin is indicated by a solid line. Double peak at spot of application is caused by cover over hole.

albumin, hydrocortisone migrated approximately 3 times as far as progesterone. This observation demonstrated that the considerable transport of progesterone by albumin (Fig. 1, bottom) and the lack of transport of hydrocortisone (Fig. 1, top) could not be the result of different intensities of adsorption on the paper.

The studies show that approximately 2 to 10 percent of hydrocortisone and more than 90 percent of progesterone were transported by and, therefore, were bound to human serum albumin. The hormone concentrations employed were only a fraction of the maximal binding capacities of serum albumin solutions for these compounds. Even at this level, a substantial proportion of the steroids was in free form.

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Continuous Ascending Chromatography—New Technique

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In recent years an impressive list of papers has been published in which the technique of ascending paper chromatography (*1*) has been the primary means of separation or identification. Where the Rf values for the desired components are small, the choice has been continuous descending chromatography or longer sheets of paper for the ascending method with necessarily larger and more elaborate chromatographic chambers. Significant diffusion occurs when the resolving solvent remains in contact with the paper after the solvent front has reached the top of the conventional ascending chromatogram. Lengthening the chromatogram does not adequately circumvent this effect, since the rate of solvent movement is markedly retarded by gravity. The new technique alleviates this shortcoming.

The procedure described here depends on the rapid removal of the solvent as it reaches the top of the chromatogram by capillary ascent (wick effect). Any suitable container is fitted with a glass, cork, wood, polyethylene, aluminum, or stainless steel cap that has one or more slits to permit the top of the ascending paper chromatogram or chromatograms to protrude. Generally, it is sufficient to seal the cap to the jar with Scotch tape. The container, preferably glass, is kept to a minimum height commensurate with the distance that the desired components will travel during the required development. The volume of the container is also kept to a minimum in order to decrease, or essentially eliminate, the time usually allotted for liquid-vapor equilibration (*2*). Ideally, the chamber should approximate the dimensions of the chromatogram. This arrangement may be approached by cutting prescription bottles or other flattened flasks to the desired height. However, spoutless beakers, test tubes, and jars of varying heights are also used. The wick that extends above the cap may be sandwiched between two short wedges of paper in order to seal the opening and to increase the evaporation area.

For most of the solvent systems used in this laboratory, there is sufficient evaporation from the wick under ordinary room conditions to remove the solvent front. For higher boiling solvents systems, the positive draught from a conventional hood or fan is adequate. If evaporation is not sufficient to remove the solvents rapidly, the wick can be bent downward and the solvent front can run off into a beaker. In practice, we have had little occasion to resort to this latter arrangement.

We have found that the new technique is more effective than the continuous descending procedure when there is need for a continuous system. Although our applications have been mainly in the fields of antibiotics and alkaloids, the dye FD&C Blue No. 1 is used simply for illustrative purposes. A commercially available descending chromatographic chamber was equilibrated overnight for the descending technique, and a 250-ml beaker with stainless steel cap was used for the ascending procedure. The FD&C Blue No. 1 was spotted from aqueous solution on Whatman No. 1 paper, air-dried for 5 min, and resolved with methyl cellosolve acetate and water (4 : 1) in the respective chambers. The results are illustrated in Fig. 1.

Typical of other findings is the appearance of three well-defined components in FD&C Blue No. 1 after 18 hr of resolution by the ascending method as against one diffused zone by the descending technique. One

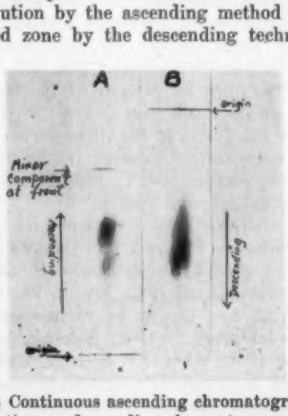

Fig. 1. (*A*) Continuous ascending chromatogram after 18 hr. (*B*) Continuous descending chromatogram after 18 hr.

component, a minor constituent, travels relatively fast and concentrates at the front, as is shown in Fig. 1. During the first 6 hr of resolution, the descending chromatogram exhibits this minor component, but it is lost through diffusion on further development. After 48 hr, the descending chromatogram did exhibit two components but in a decidedly diffused and streaked condition.

The simplicity and rapidity of the new technique affords the laboratory a continuous system for ascending chromatography at a minimum cost.

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Detoxication of Drugs and Other Foreign Compounds by Liver Microsomes

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Recent studies demonstrating that diethylaminoethyl diphenylpropylacetate HCl (SKF 525-A) inhibits the rate of biotransformation of drugs metabolized by a diversity of metabolic pathways (*1, 2*) suggested that the tissue catalysts responsible for their metabolism possess certain factors in common. This report describes experiments which show that common denominators in the metabolism of a variety of foreign compounds (Table 1) are most unusual and include localization of the enzyme systems in liver microsomes and requirements for both reduced triphosphopyridine nucleotide (TPNH) and oxygen.

Table 2. Requirements for the demethylation of monomethyl-4-aminoantipyrine by dialyzed rabbit liver homogenate.

Additions	Amount of 4-aminoantipyrine formed (μM)
Complete system*	1.53
Minus Mg^{++}	0.99
Minus glucose-6-phosphate	0.87
Minus nicotinamide	0.15
Minus TPN	0.14
Diphosphopyridine nucleotide in place of TPN	0.20

* To 2 ml of liver homogenate (1 : 2 in 0.2*M* phosphate buffer, pH 7.4) were added 100 μM of nicotinamide, 75 μM of $MgCl_2$, 0.2 μM of TPN, and 5 μM of monomethyl-4-aminoantipyrine to a final volume of 5 ml. Incubation was for 1 hr at 37°C in air.

From the results in Table 2, which show the requirements for the demethylation of monomethyl-4-aminoantipyrine in homogenates of dialyzed rabbit liver, it is seen that the reaction is enhanced by nicotinamide, triphosphopyridine nucleotide (TPN), Mg^{++}, and glucose-6-phosphate. Similar requirements were also found for the metabolism of the other drugs listed in Table 1.

The cellular localization of the biochemical reactions was determined by measuring the activity of cellular fractions separated by differential centrifugation of liver homogenates (*11*). Table 3 shows that both microsomal and soluble fractions of liver are required for drug metabolism. Nuclei and mitochondria, on the other hand, show virtually no activity.

The role of the soluble fraction in the reactions was suggested by the afore-mentioned stimulation by glucose-6-phosphate together with the presence of considerable glucose-6-phosphate dehydrogenase activity in the soluble fraction. These observations indicate that TPN might be required in the homogenate in the reduced form, TPNH, and that glucose-6-phosphate

Table 1. Reactions catalyzed by enzyme systems in liver microsomes. Analytic methods are described in the references cited.

Type of reaction	Substrate	Products	Reference
Barbiturate side-chain oxidation	Evipal (hexobarbital)	Keto-evipal	(*3*)
	Nembutal (pentobarbital)	Nembutal alcohol and nembutal carboxylic acid	(*4*)
Dealkylation	Pyramidon (dimethyl-4-aminoantipyrine)	4-Aminoantipyrine + formaldehyde	(*5*)
	Monomethyl-4-aminoantipyrine	4-Aminoantipyrine + formaldehyde	(*5*)
	Monoethylaniline	Aniline + acetaldehyde	(*6*)
	Ephedrine	Norephedrine + formaldehyde	(*7*)
Deamination	Benzedrine (amphetamine)	Phenylacetone + ammonia	(*8*)
Ether cleavage	Codeine	Morphine + formaldehyde	(*9*)
	Phenacetin (*p*-ethoxyacetanilide)	*p*-Hydroxyacetanilide + acetaldehyde	(*9*)
Hydroxylation	Aniline	*p*-Hydroxyaniline	(*10*)
	Acetanilide	*p*-Hydroxyacetanilide	(*10*)

dehydrogenase or some other TPNH-producing enzyme is an important component of the soluble fraction. Substantiation of this hypothesis was afforded by the finding that the substrates in Table 1 are metabolized in washed microsomes incubated with TPN, glucose-6-phosphate, and glucose-6-phosphate dehydrogenase at rates comparable to those in the whole homogenate. The addition of chemically prepared TPNH to washed microsomes also effects the metabolism of the various drugs—direct evidence that TPNH is involved in the various reactions. It may be concluded from these results that the drug enzyme systems are located in the microsomes and that the soluble fraction participates by maintaining TPN in the reduced form.

A number of observations indicate that the metabolic pathways in Table 1 are not catalyzed by a single enzyme system. For example, microsomes prepared at *p*H 7.0 rapidly lose their ability to hydroxylate aniline and acetanilide but not to dealkylate monomethyl-4-aminoantipyridine; SKF 525-A inhibits most of the reactions in Table 1 but does not appreciably affect the hydroxylation of aniline and acetanilide; the inhibitor blocks the ether cleavage of phenacetin but not of codeine.

It is unusual for enzyme systems to require both TPNH and oxygen. A common step in the various microsomal reactions could involve the production of hydrogen peroxide by the oxidation of TPNH. The generated peroxide might then be utilized by peroxidaselike enzymes to catalyze the transformation of the various foreign compounds. It is likely that the number of these enzymes is relatively small and that they are unusually nonspecific.

The distribution of the drug enzyme systems in various rabbit tissues was examined and, in general, the various drugs were found to be metabolized only by the microsomes in liver. The localization of these functions in liver is of particular interest since it imparts an unusual specialization to the submicroscopic particles of this tissue.

Table 3. Cellular localization of enzyme systems catalyzing hydroxylation of acetanilide and demethylation of monomethyl-4-aminoantipyrine in rabbit liver.*

	Percentage of total activity†	
	Hydroxylation	Demethylation
Whole homogenate	100	100
Microsomes	1	3
Soluble fraction	0	3
Microsomes + soluable fraction	77	102

* *Incubation conditions.* Hydroxylation system: Flasks contained 1 ml of liver homogenate (1 : 2) in isotonic KCl, 5 μM of nicotinamide, 0.25 μM of TPN, 10 μM of acetanilide, and 0.5 ml of 0.5*M* tris-phosphate (1 : 1) buffer, *p*H 8.5; final volume, 3.5 ml. Incubation was for 1 hr at 37°C in air. Dealkylation system: As described in Table 2.

† Whole homogenate activity taken as 100 percent.

It is interesting to consider the question of whether or not the metabolism of foreign compounds by the microsomal enzyme systems is merely incidental to the normal regulation of body processes. In view of the relative nontoxicity of SKF 525-A, one can speculate that these systems are not essential to the normal economy of the body, but operate primarily against the toxic influences of foreign compounds that gain access to the body from the alimentary tract.

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Dicentrics in Wheat

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Dicentric chromosomes are chromosomes that have two centromeres. They are no longer oddities in biological research because they commonly occur after breakage and reunion in chromosomes following irradiation or a treatment with some radiomimetic substance. No observations of the behavior at meiosis of artificially produced dicentrics have been reported, because few of them have persisted. Usually they are altered or eliminated in the mitotic divisions and do not reach the germ line. There have been only a few naturally occurring dicentrics (*1*). Two naturally occurring dicentrics persisted in wheat and have been studied at both mitosis and meiosis (*2*). The behavior of dicentrics at meiosis is especially interesting because the centromere plays an important role in pairing, chiasma formation, and chromosome movement—phases of activity about which there is still very little known. This report concerns the progress of a 2-yr investigation into a possible source of dicentrics.

In a previous paper I outlined a theory for the formation of dicentric chromosomes. I proposed that the dicentrics arose after fracture of univalent chromosomes at meiosis with the fusion of two broken ends in a subsequent resting stage. This theory was based on observations of meiotic stages in parental pentaploid material and also, of course, on the occurrence of a dicentric chromosome in one plant of an F_2 progeny. To test this hypothesis further, the interspecific cross *Triticum aestivum* ($2n = 42$) × *T. durum*

($2n = 28$) was made. The F_1 plants were partially fertile (about 45 percent) and I now have on hand 75 g of F_2 seed. The number of chromosomes in each seedling will be determined by germinating the seeds on absorbent paper and examining metaphase of mitosis in the primary roots. The chromosome number of the seedlings should vary from 28 to 42. Fragment chromosomes should be fairly common, and I had originally hoped for a dicentric in every 100–200 seeds. So far, 40 seeds have been examined, and out of these I have isolated two plants that have a dicentric chromosome.

One seedling had 27 normal chromosomes and a dicentric. Some variability in number existed among cells, depending upon how the dicentric separated and upon the inclusion or exclusion of broken arms following rupture of bridges (Table 1). The variability in the length of the intercentric region also shows that some bridges were formed by the separation of the dicentric chromatids. The dicentric was present in only two of the three roots examined. The third root had 28 chromosomes. The distal arms of the dicentric were not equal—thus, the dicentric is not an isodicentric. All other viable F_2 seeds have had four satellited chromosomes. In the cells of this plant only three satellited chromosomes are obvious and possibly one satellited chromosome is involved in the dicentric.

The other dicentric was found in a seedling with 39 normal chromosomes. The chromosome number varied considerably in the cells of this plant. The dicentric was present in only about one-quarter of the cells of the one root examined in detail. It was present in two of the three roots examined. Many of the cells with resting nuclei had micronuclei, indicating a loss of some chromosome material. This dicentric is probably less stable than the one first described.

Photomicrographs from wheat root-tip cells of dicentric chromosomes with some normal chromosomes for comparison. Figures 1, 2, and 3 are dicentric A, and Fig. 4 is dicentric B. Note the dissimilar distal arms in the dicentric B. Workers unfamiliar with wheat chromosomes may confuse these chromosomes with those that have a secondary constriction. Those who are familiar with wheat chromosomes will note the differences in length and the position of the two constrictions. (×2000)

Table 1. Variability in chromosome number and the presence or absence of dicentrics in the root tips from the two plants.

Dicentric A		Dicentric B	
No. of chromosomes	No. of cells	No. of chromosomes	No. of cells
27 plus a dicentric	19	39 plus a dicentric	8
28 no dicentric	2	39 no dicentric	2
29 no dicentric	1	40 no dicentric	16
	—	41 no dicentric	5
	22		—
			31

Since the dicentrics were not isodicentrics, it is unlikely that they arose from sister reunion after a break in a chromosome. I feel that they support my original theory on the origin of dicentrics in wheat. In any event their presence shows that F_2 seed of an interspecific cross is a likely source of experimental material. Whether these dicentrics will persist until meiosis remains to be seen. They are present in combinations of chromosomes that should have considerable fertility. Seed set may be good, and the dicentric may be transmitted intact. It may also be possible to use these stocks in a planned breeding program. They offer several possibilities.

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Non-Mendelian Segregation in a Single Tetrad of Saccharomyces Ascribed to Gene Conversion

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Gene conversion (*1*) is the interaction, occurring at meiosis, between the dominant and the recessive allele in a heterozygote, resulting in the transformation of one or more dominant alleles into the corresponding recessive allele, or vice versa. Gene conversion is essentially a directed mutation occurring at meiosis as a result of the effect of homologous alleles upon each other; it does not occur (or is not apparent) at the meiosis of homozygous diploids.

Conversion of white to pink yeasts has been pre-

viously reported (*2*): two tetrads, each producing one white and three pink cultures, were discovered in a pedigree comprising 60 tetrads; in 57 other tetrads, regular segregation of the genes controlling pinkness and whiteness occurred. (All four clones were white in one tetrad because of the segregation of a tetraploid zygote.) The 3 : 1 segregations were ascribed to gene conversion, but the clones arising from the tetrad were not studied genetically.

After these data had been collected, more than 2500 tetrads were analyzed before the appearance of the irregular tetrad, which is the subject of this paper. Nearly one-half of the asci were heterozygous for pink and white, and regular segregation of pinkness and whiteness occurred in all heterozygous tetrads. No pink cultures were found among the numerous progeny of hybrids homozygous for white, proving that mutation from white to pink (as distinguished from gene conversion) is extremely rare. Homozygous pink hybrids invariably produced four pink clones per tetrad. The stability of the pink-white pedigree, indicated by the 7-yr lapse before finding a third irregular tetrad, establishes its usefulness as a genetical marker and validates its choice as an indicator of non-Mendelian segregation.

Pink cultures are adenine-dependent (*3*). Pink clones undergo variation from pink (adenine-dependent) to adenine-dependent white with high frequency on *vegetative* reproduction. The derived white cultures are stable on vegetative reproduction (on media containing adenine) with regard to both adenine-dependence and whiteness. When adenine-dependent white clones (derived from pink) are outcrossed to normal white clones (that is, adenine-independent), regular (2 : 2) segregation of pink (adenine-dependent) and white (adenine-independent) is found among the tetrads, proving that the change from adenine-dependent pink to adenine-dependent white occurring on vegetative growth has not affected the gene controlling adenine-dependence. Throughout this analysis all clones were tested for adenine-dependence and adenine-independence by growth in an adenine-deficient medium; all pink clones were adenine-dependent and all adenine-dependent clones were pink immediately upon isolation of the ascospores. Thus, the variation (*Dauermodifikation*) from adenine-dependent pink to adenine-dependent white occurring in vegetative propagation did not constitute a difficulty in the genetical analysis.

The purpose of this paper is to present the genetical analysis of the clones derived from the recently isolated irregular tetrad for pink and white, since the individual clones derived from the irregular tetrads previously described were not analyzed genetically. The genotype of the exceptional tetrad is described in Fig. 1 (family I). The zygote was heterozygous for the genes *DX/dx*, *GA/ga*, and *MG/mg* in addition to the genes controlling pinkness and whiteness. *DX/dx* segregated independently of *GA/ga*, producing a tetratype tetrad and proving that all four products of meiosis had been recovered and, therefore, that the irregularity in regard to pinkness and whiteness could not be the result of the disintegration of one of the four nuclei produced by meiosis and its replacement by an extra mitosis following the meiosis—a mechanism originally proposed by Winge and Roberts (*4*).

Nine other sister tetrads in family I showed regular segregation for pinkness and whiteness. Families II and III were produced by outcrossing the white culture derived from the irregular tetrad by pink cultures from other sources. A sample tetrad from each family is described in which regular segregation for at least three separate marker genes occurred, thus establishing the regular haploid nature of the white culture derived from the irregular tetrad. Families IV, V, and VI, respectively, show the results of outcrossing the three different pink clones derived from the irregular tetrad with other haploid stocks. The regular segregation of the genes for which the outcrosses were heterozygous in all three families establishes the regular haploid nature of the three pink cultures. The fact that all four clones are haploid excludes the possibility that

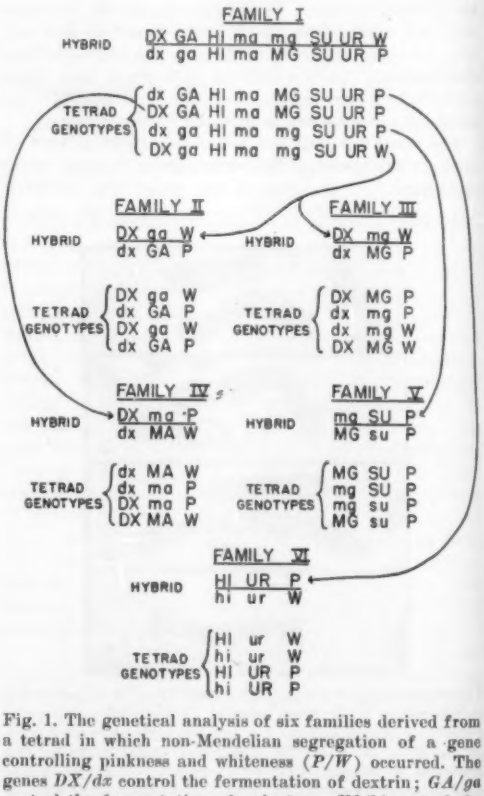

Fig. 1. The genetical analysis of six families derived from a tetrad in which non-Mendelian segregation of a gene controlling pinkness and whiteness (*P/W*) occurred. The genes *DX/dx* control the fermentation of dextrin; *GA/ga* control the fermentation of galactose; *HI/hi* control the synthesis of histidine; *MA/ma* control the fermentation of maltose; *MG/mg* control the fermentation of alpha-methyl glucoside; *SU/su* control the fermentation of sucrose; and *UR/ur* control the synthesis of uracil.

the irregular ratio could have originated by fusion following an extra mitosis, as was proposed by Winge and Roberts (*5*).

The haploid nature of the four clones from the irregular tetrads was confirmed by other criterions of ploidy. Pittman and Pedigo (*6*) studied their x-ray survival rates and found that they yielded target values of 1, proving their haploid nature. Ogur and St. John (*7*) analyzed the nitrogen per cell and the Klett reading per cell and found that these criterions of ploidy also established the haploid nature of the four cultures. Detailed genetical analysis of the families will be presented elsewhere (*8*).

Since no other proposal concerning a mechanism capable of producing three recessives and one dominant from a diploid zygote has proved adequate, it is inferred that the irregular segregation described here is an example of gene conversion.

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17 January 1955.

Communications

Structure of Diatretyne 2, an Antibiotic Polyacetylenic Nitrile from *Clitocybe diatreta*

The polyacetylene, diatretyne 2 (*1, 2*), that is, "diatretyne nitrile" has the structure 7-cyano-2-heptene-4,6 diynoic acid (I), which differs from that of diatretyne 1 (*2*)—that is, "diatretyne amide" (II)—only in that it possesses a nitrile group instead of the amide group (*3, 4*).

$$\underset{\text{(diatretyne nitrile)}}{\underset{\text{(I)}}{HOOC{-}CH{=}CH{-}C{\equiv}C{-}C{\equiv}C{-}C{\equiv}N}}$$

$$\underset{\text{(diatretyne amide)}}{\underset{\text{(II)}}{HOOC{-}CH{=}CH{-}C{\equiv}C{-}C{\equiv}C{-}CONH_2}}$$

The antibiotic activity previously attributed to II (*1, 5*) was due entirely to contamination with about 1 percent of I. A synthetic sample of II (*6*), as well as a natural sample freed of I by countercurrent distribution, showed no activity against *Micrococcus pyogenes* var. *aureus* in concentrations as high as 1 mg/ml. Diatretyne nitrile is active at a concentration of about 0.1 μg/ml.

The structure of I was elucidated by analysis of the polyacetylene and its reduction product, in conjunction with the ultraviolet absorption spectrum of I (*1, 2*) and by interconversion of the nitrile and amide.

A sample of I gave the following analytic values: found, C 66.19, H 2.15, N 9.70, O 22.05, N.E. 143; calculated for $C_8H_3NO_2$ (145.11), C 66.21, H 2.08, N 9.65, O 22.05, N.E. 145.

Catalytic reduction of I using Adams PtO_2 catalyst gave a crystalline water-soluble product, which analyzed well (except for the N value) for $C_8H_{17}NO_2$, the molecular formula for an amino-octanoic acid, presumably III, the expected reduction product of I. The low N value may be due to the presence of secondary amine (IV), a probable by-product of the reduction. Found, C 60.36, H 10.56, N 7.91; calculated for $C_8H_{17}NO_2$, C 60.34, H 10.76, N 8.80. Calculated for a mixture of 87 percent of III plus 13 percent of IV, C 60.79, H 10.71, N 8.25.

$$\underset{\text{(III)}}{HOOC(CH_2)_6CH_2NH_2} \qquad \underset{\text{(IV)}}{[HOOC(CH_2)_6CH_2]_2NH}$$

The ultraviolet absorption spectrum of I shows maxima characteristic of an entriyne (*1, 2*); that is, the C ≡ N grouping conjugated to the acetylenic system behaves chromophorically like a C ≡ C grouping in the same position.

Diatretyne nitrile was hydrolyzed to II and the reaction followed spectrophotometrically. The product was isolated and analyzed. The analytic values agreed with the theoretical for II plus about 11 percent of the di-acid: found, C 58.70, H 3.30, N 7.61, O 30.30; calculated for $C_8H_5NO_2$ (163.13), C 58.90, H 3.09, N 8.59, O 29.42; calculated for a mixture of 89 percent of the amide and 11 percent of the acid, C 58.86, H 3.02, N 7.64, O 30.48.

The reverse conversion, dehydration of II to I involved distillation from P_2O_5, in vacuum at about 150°C. As was to be expected, the yield of I was only a few percent of the theoretical, owing to destruction of the major portion of the polyacetylenes under these relatively drastic conditions. However, the presence of I could be demonstrated by the ultraviolet absorption spectrum of the product and by its activity against *M. pyogenes* var. *aureus*. The ultraviolet absorption spectrum showed the maxima characteristic of I. The potency of the product calculated on the basis of its optical density at 302 mμ compared with the known $E^{1\text{ percent}}_{1\text{ cm}}$ value of the maximum of I at this wavelength was the same as that of pure samples of I.

Nitriles of biological origin have rarely been reported (*7*), and I is believed to be the first example of a biologically produced polyacetylenic nitrile. Its antibiotic activity must be attributed entirely to substitution of a nitrile group for an amide group, in a molecule of otherwise identical structure (*2*). The

presence of II and I in the same culture liquid poses the question of the mechanism of their synthesis by the organism and suggests as one possibility the existence of an enzyme that catalyzes their interconversion, namely, an amide dehydrase.

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5 January 1955.

Association of Susceptibility to Poliomyelitis with Eye and Hair Color

Minto (*1*) recently stated that, in an investigation of 1183 cases of poliomyelitis in members of the Caucasian race, only 18 had blond hair and, of these, only one had blue eyes. The sex and age groups of the population concerned were not given, but presumably the data referred to children of both sexes. As a result of the present investigation (*2*), no significant color differences were found in a series of men born in the British Isles who have had poliomyelitis, either as children or as young adults, when compared with a similar series of men who have not had this disease.

Records of 914 cases of poliomyelitis in the service personnel of World War II were collected from the Ministry of Pensions and National Insurance; this was the total number of such cases in which the eye and hair color were recorded. A control series of 5127 cases of injury had previously been made for investigations into a possible association between pigmentation and disease (*3, 4*). (The classification of color types used is that of MacConaill (*5*), namely, blond—blue or gray eyes and fair hair; dark—brown eyes and dark hair; glaucope—blue or gray eyes and dark hair; and cyanope—dark eyes and fair hair. *Blue eyes* in this paper means blue, gray or blue-gray.) Because the proportions of the different color types vary with age, the data have been divided into 5-year age groups. (Eye color does not vary significantly within the age limits of the present series.) It is also known that the proportions vary in different parts of the British Isles, but London was the only area in which there were sufficient cases for this further breakdown of the data.

The differences between the two series are small. They amount to an excess of fair hair and the blond type in the poliomyelitis cases as compared with those of injury. The differences are not significant, the values of P for the complete series being 0.01–0.02 for hair color and 0.02–0.05 for the MacConaill types, and 0.2–0.3 and 0.3–0.5 for the same characters in the London area.

The records of eye and hair color in these cases were made by recruiting boards. To attempt a discussion of fine degrees of color variation on such evidence would be absurd, but there are good reasons for stating that the records are accurate insofar as main color divisions are concerned, for example, fair and dark hair, blue and nonblue eyes. Following are examples of such reasons. (i) The darkening of fair hair with advancing age is known (*6*). The fall in the proportion of fair hair and the blond type in the older age groups is well shown in the series of injuries. (ii) The association of melanoma with the blond type is known (*7*). The 36 cases of this tumor in the Ministry's records in which eye and hair color were recorded showed percentages of 77.8, 41.7, and 33.3 for blue eyes, fair hair, and the blond type, respectively, as compared with 59.3, 24.0, and 19.1 in the control series of injuries. (iii) The percentage of hair classified as "red" in the series of injuries is 3.3, showing no significant difference from the recorded proportions of this color in European stocks (*8*).

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17 February 1955.

Preliminary Description of Coffinite—a New Uranium Mineral

A new extremely radioactive black mineral from the La Sal No. 2 mine, Mesa County, Colorado, was collected by L. B. Riley, L. R. Stieff, and T. W. Stern, of the U.S. Geological Survey, in August 1951. This new mineral, a uranous silicate ($USiO_4$) with some $(OH)_4^{-4}$ substituting for $(SiO_4)^{-4}$, has been named coffinite in honor of Reuben Clare Coffin. Coffin has made extensive geologic investigations in southwestern Colorado. His report on the uranium-vanadium deposits of the Colorado Plateau (*1*) has been a major contribution to the understanding of the geology of this area.

Since the collection of the first sample of coffinite, we (*2*) and others have identified this mineral from more than 15 uranium mines in the Triassic and Jurassic sediments of the Colorado Plateau. The new mineral has also been collected from mines in the Tertiary sediments of the Gas Hills area, Fremont County, Wyoming, from mines in the pre-Cambrian metasediments near Globe, Arizona, and from the Copper King mine, a vein deposit in Larimer County, Colorado, as well as from several foreign localities.

Coffinite is a major uranium mineral in the unoxidized ores of the Colorado Plateau. It is commonly black with an adamantine luster. In transmitted light, coffinite is opaque except on thin edges, but in fragments of minus 325-mesh size (less than 44 μ), it is pale to dark brown. It is closely associated in the Colorado Plateau with carbonaceous material, uraninite, black vanadium minerals, pyrite, quartz, and clay. The mineral is very fine grained, and a clean separation of it from the organic and other fine-grained material has not been successful to date. Its fine-grained nature is also shown by broadened lines in its x-ray diffraction powder pattern. The highest specific gravity of coffinite concentrates relatively free of organic contamination is 5.1. A fuller description of coffinite is in preparation.

Coffinite is best identified by its x-ray powder pattern. It is tetragonal ($a_0 = 6.94$ A and $c_0 = 6.31$ A for material from the Arrowhead mine, Mesa County, Colorado) and has strong lines at 4.66, 3.48, 3.47, 2.65, 2.64, and 1.80 A. These measurements vary slightly from sample to sample. The x-ray powder pattern is similar to that of thorite ($ThSiO_4$), but the mineral contains no thorium.

Several samples of the purest coffinite concentrates have been analyzed by A .M. Sherwood. These analyses show as much as 61 percent uranium with varying amounts of silicon, arsenic, and vanadium. There is not sufficient SiO_2 present in these samples for the mineral to be a simple uranous silicate. Detailed leaching studies have shown that arsenic, vanadium, and aluminum are not essential constituents.

Infrared analyses on minus 400-mesh, vacuum-dried coffinite by R. G. Milkey (U.S. Geological Survey) show strong absorption in the regions between 2.8 and 3.1 μ. These two absorption bands are characteristic of bonded OH groups with some unbonded OH and isolated SiO_4 tetrahedra, respectively. The deficiency of silica and the presence of bonded OH groups suggest that $(OH)_4^{-4}$ has substituted for $(SiO_4)^{-4}$. Frondel (*3*) found that this substitution exists in thorogummite, $Th(SiO_4)_{1-x}(OH)_{4x}$, which is the hydroxyl-containing variant of thorite in which $(OH)_4^{-4}$ substitutes for $(SiO_4)^{-4}$. The proposed chemical formula for coffinite is $U(SiO_4)_{1-x}(OH)_{4x}$.

Attempts to synthesize $USiO_4$ by G. W. Morey (Geophysical Laboratory, Carnegie Institution of Washington), Clifford Frondel (U.S. Geological Survey and Harvard University), and S. M. Lang (National Bureau of Standards), as well as attempts in the U.S. Geological Survey laboratories, have not been successful to date.

A. D. Weeks, M. E. Thompson, and A. J. Gude, III, of the Survey, and Frondel have also worked on this problem. This work is part of a program being carried on by the Survey on behalf of the divisions of raw materials and research of the U.S. Atomic Energy Commission.

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T. W. Stern
A. M. Sherwood
U.S. Geological Survey, Washington 25, D.C.

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22 March 1955.

The Measurement of Rotational Speed with a Sonometer

A simple device for the measurement of centrifugal speeds from 50 to 220 cy/sec without contact between the instrument and the rotating object is described here. An application of this device in measuring the speed of the Servall centrifuge (Model SSI), as used in recent experiments on brain particulates in this laboratory (*1*), is also given (Fig. 1).

A permanent magnet *M*, made from a piece of razor blade, is affixed with adhesive tape to the upper surface of the screw that holds down the lid of the rotating centrifuge bowl. The blade does not disturb the balance of the centrifuge. On level with the magnet, a small electromagnetic coil *C* is mounted on the cage of the centrifuge in such a position that the poles of the permanent magnet, when rotated, pass close to the soft-iron core of the electromagnet. Thus, the elements of an alternating-current generator are formed, with the magnet as rotor and the coil as the stator. The alternating current produced is amplified by an audio-frequency amplifier *A* and passed through the wire of a sonometer which, in turn, passes between the poles *N* and *S* of a permanent magnet. The string (a

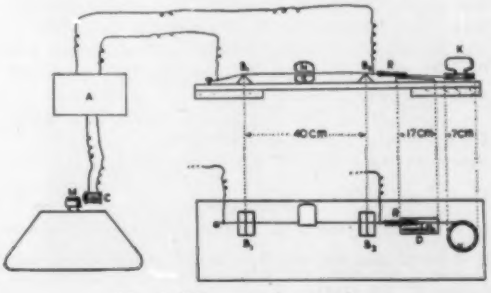

Fig. 1. Diagram of sonometer.

40-cm length of copper wire, 0.3 mm in diameter) is attached at one end to a screw that serves for readjustment of the sonometer in case it gets "out of tune," then passes over two bridges, B_1 and B_2, made of glass rods; at the other end it is attached to an expansion spring R, which may be stretched by turning the knob K of a wooden pulley. The spring should be able to carry a load of 1 kg. A pointer P is attached to the movable end of the spring over a scale D. The latter is calibrated in terms of the tension in 100-g units by means of weights varying between 50 and 1000 g.

When the tension is so adjusted that the natural period of the wire is the same as that of the alternating current, the wire begins to vibrate. The frequency of vibration f of the sonometer wire is expressed in terms of cycles per second. Thus,

$$f = \frac{1}{2L}\sqrt{\frac{T}{m}},$$

where T is the tension in the wire in dynes, L is the length of the wire, and m is its mass-per-unit length. If a tuning fork of known frequency is used to measure f, then L, m, and an instrument constant c may all be incorporated in one constant k. Hence, $f = k\sqrt{T}$.

In order to calibrate the instrument, k is first determined as follows. The tension in the wire is adjusted until it resonates with the vibrating tuning fork (of frequency f) whose base is held on the wooden framework of the sonometer. The value for T is indicated by the pointer P, the scale having been calibrated previously with weights. The known values are then substituted in the equation.

When the speed of rotation is measured, the tension in the sonometer wire is varied until the wire vibrates with maximum amplitude. Owing to the small intensity of the current coming out of the amplifier, the wire vibrates only at the natural frequency of the current. It is possible to measure speeds higher than those registered on the scale since the harmonics of the vibrating wire can be obtained by varying the tension. In such cases the frequency reading on the scale should be multiplied by the number of internodes observed.

The accuracy of the instrument was tested stroboscopically, and the deviation between the two methods was found to be about 1 percent. This error is greater than that of more complex instruments described in the literature (*2*), but the sonometer described has the advantage of simplicity and may be constructed with ease in any laboratory.

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8 February 1955.

Uncritical Citation of Criticized Data

In an earlier communication, Zirkle (*1*) discussed the citation of fraudulent data, particularly the refuted work of Paul Kammerer, the Viennese zoologist who claimed to have proved that acquired characteristics are inherited. Zirkle pointed out that reports of Kammerer's work are beginning to creep back into current literature, and that, either knowingly or unknowingly, some of those who cite his findings have failed to mention the damning criticisms.

Zirkle's note suggested to us somewhat analogous situations in the field of psychology. Therefore, we attempted to determine whether two much disputed studies (fraud was not alleged for one or definitely proved for the other) relating to the stability of the IQ are being quoted in current psychological textbooks without criticism.

In 1938 a group of experimenters at the University of Iowa published a monograph (*2*) that showed large increases in the IQ's of a group of preschool orphans who were given the opportunity to attend nursery schools. Beth L. Wellman popularized their findings by writing reports for several periodicals (*3*). The "Iowa studies of raising the IQ" were subsequently criticized, primarily for erroneous statistical procedures employed, by Simpson (*4*), Goodenough and Maurer (*5*), and McNemar (*6*). Although Wellman attempted to refute these criticisms (*7*), many psychologists found her defense unconvincing.

Similarly, in 1946 there appeared in *Psychological Monographs* (accompanied by an editorial note with regard to its controversial nature) a study by Bernardine G. Schmidt (*8*) that reported phenomenal increases in the IQ's of children originally classified as feeble-minded. She popularized her conclusions in several journals (*9*) and became the object of much publicity (*10*). Then Kirk played detective and unearthed many aspects of Schmidt's work that seemed to invalidate her most important claims (*11*). When Goodenough (*12*) later reviewed Schmidt's monograph, her remarks were for the most part quite critical. Nolan (*13*) published a rather informal survey of opinions of several leading psychologists who had attempted studies similar to Schmidt's concerning the validity of her findings. The general consensus was that her investigation had many crucial flaws.

In searching through 21 textbooks in child, educational, and general psychology, all published not earlier than 1949, we found a number of references to the controversial studies of Wellman and Schmidt. Approximately one-half of the books did not mention either of the investigations, and it was gratifying to find that 73 percent of the writers who did refer to them also included criticisms. However, three educational psychology textbooks (*14*) cited the Iowa studies as evidence of the instability of the IQ, but did not criticize them. All writers who referred to Schmidt's study also made critical remarks concerning it.

The uncritical citation of disputed data by a writer, whether it be deliberate or not, is a serious matter. Of course, knowingly propagandizing unsubstantiated

claims is particularly abhorrent, but just as many naive students may be swayed by unfounded assertions presented by a writer who is unaware of the criticisms. Buried in scholarly journals, critical notes are increasingly likely to be overlooked with the passage of time, while the studies to which they pertain, having been reported more widely, are apt to be rediscovered.

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3 February 1955.

Natural Dams of Havasu Canyon, Supai, Arizona

Inaccessible except on foot or on horseback, Havasu Canyon is a deep-sided canyon in the southwestern part of Grand Canyon National Park. It is reached only by steep winding trails.

Emerging from the Supai formation, some 2700 ft below the rim of the Grand Canyon, are a series of fresh-water springs whose overflows join and flow down through Havasu Canyon. This creek, bearing the same name as the canyon, once had beautiful blue-green water. Hence, the Indians living there are called the *Havasupais,* which, translated, means "the blue-green water people."

In addition to its phenomenally colored water, Havasu Creek deposits spectacular mineral dams across parts of its course north of the Supai village (Fig. 1). These dams sometimes build upward as much as 2 ft a year. The local Indians give little thought to this until the water levels at the fords become so deep

Fig. 1. Natural dams near the base of Havasu Falls.

that their feet get wet when they are crossing them on horseback. When this annoying height is reached, the dams are breached with explosives until the water levels return to a convenient fording height.

Although they readily encrust any submerged twig or root (Fig. 2), the minerals never seem to impregnate porous, dead bits of wood. Other than arching downstream, there is little consistency in the method of mineral deposition or in the structure of the dams. Anything resisting the flow of the creek tends to become encrusted with minerals and to initiate a dam. Analyses of mineral samples indicate that the subaqueous deposits are primarily calcite with some admixed clay. Remnants of older and higher deposits of minerals now visible along the lateral areas of Havasu Canyon contain layers of crystalline calcite, aragonite, and clay, as well as manganese oxide stains, on their weathered surfaces. Both old and recent deposits are rich sources of impressions of past and present vegetation in this region.

Water spray from the base of Havasu Falls drifts and covers the nearby trees. Evaporation of the moisture causes minerals to deposit as layers toward the direction from which the spray comes. Even living trees may have their twigs so heavily covered with mineral residues that their buds have difficulty emerging from any side but the one opposite the layers of minerals. These residues contain mostly aragonite, some calcite, and included clays.

A flash flood rampaged through Havasu Canyon in August 1954. Tumbling debris destroyed many of the mineral dams and altered the crests and spillways of

Fig. 2. Inside an old natural dam showing the nature of mineral deposits on twigs and branches.

Fig. 3. Navajo Falls with its "draperies" of mineral deposits.

some of the waterfalls. The blue-green waters ran muddy. Supai residents report that, even after 6 mo, only the section of the creek above Navajo Falls is gradually turning blue-green again. Below the falls, the water still flows murky or cloudy.

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3 February 1955.

Security

The statement of the AAAS board of directors concerning national security [*Science* **120**, 957 (1954)] is fine as far as it goes. A suggestion that we consider the positive, as well as the negative, aspects of "security" is long overdue and altogether good.

It is disappointing, however, to find the board of directors accepting without question the vast majority of the premises that underlie our present practices and ignoring so many of the implications of these assumptions. It may well be that our present security system is the best possible compromise between conflicting necessities and that debate will leave us exactly where we started. It would be better, however, to reach this conclusion as the result of lengthy analysis and vigorous argument rather than simply taking it for granted. We seem to be making decisions of enormous importance on the basis of assumptions that have never been clearly defined or critically examined and with no consideration of alternatives.

There seems to be considerable danger that we shall destroy our traditional sources of strength in an effort to meet the Communists on their own ground. We are so fascinated by the thought of "fighting fire with fire" that we have ignored Hayakawa's comment that "professional firemen seem to prefer water. . . ." Can we outdo the Communists in secrecy, regimentation, and isolation? Is there any proof that we should be stronger if we did?

As long as the facts themselves are secret, it is impossible to say that the secrecy that surrounds so much of our present effort is good or bad. The burden of proof, however, would seem to be on those who advocate it: on the face of it, our measures have not greatly inconvenienced the Communists, but they have certainly hampered us. They not only have enmeshed our scientists and technicians in a web of red tape; they have also made government service repulsive to anyone who objects to working with the Gestapo breathing down the back of his neck. Secrecy gives us a temporary advantage at the cost of a permanent handicap. World War II was not won by secret weapons but by industrial productivity and technologic resourcefulness. If the millions of dollars that have been spent on secret police and loyalty reviews (and all the waste of time and talent that goes with them) had been spent on research, would we not be stronger?

It even seems possible to question the wisdom of the board of directors in affirming agreement with the popular belief that "disloyalty is not to be tolerated anywhere." "Disloyalty" is a too vague and changeable concept to serve as a safe foundation for policy. Increasingly, it seems to mean dissenting beliefs, excessive individuality, or simply lack of orthodoxy. But dissent and unorthodox opinions—even to the point of heresy—are as essential to the health of the body politic as exercise is to the human body. We cannot debate issues of national importance if no one will argue the unpopular side. And action without discussion should have no place in a democracy.

Even if this were not true, we must weigh the cost of tolerating heresy against the cost of extirpating it. (There is no real question of coddling traitors; we have adequate laws and an efficient FBI to control overt acts against the state. All that security regulations and loyalty purges can add is control of opinion and its expression.) To eliminate all "disloyalty"—under any definition—inevitably involves great damage to our traditions and personal relationships and great injustice to many innocent individuals.

Thomas Jefferson suggested that anyone who wished to destroy this Union be allowed to "stand unmolested, as a monument to the impunity with which error can be tolerated when reason is free to correct it." Has this principle served us so poorly in the past that we must reject it now?

The General Electric Company recently ran an ad-

vertisement featuring Steinmetz. It was an appropriate gesture; few men have contributed more to G.E.—and not many have done more for the United States. But the advertisement did not note that Steinmetz would not be eligible for employment at G.E. today, would not even be admitted to the United States; he was an avowed Marxist. One cannot help wondering which culture pattern has the greatest survival value: a capitalism so self-confident that it finds even its severest critics a source of strength, or one so timid that it rejects the help of even its best friends.

WM PALMER TAYLOR

416 Ross Avenue, Hamilton, Ohio

14 March 1955.

Status Emeritus

Status emeritus is becoming a well-known clinical syndrome; it develops at all levels of postacademic and professional life. The psychosomatic impact of retirement is becoming an increasing problem; it is one of the by-product phenomena of an aging population. It has long been recognized in the business and commercial-industrial world where many successful procedures have been adopted to smooth the adjustments of transfer. The pension period of labor and management is becoming less dedicated to the barrenness and futility of senescence. Little consideration has been given, however, to the retirement problems associated with the scientist and those specializing in the various fields of medicine where research may be and frequently is the *vis a tergo* of life itself. Recent communications by A. Silverman [*Science* **120**, 278 (1954)] and H. S. Conrad [*Science* **120**, 581 (1954)] point up the economic and scientific problems, but little emphasis is given to the psychosomatic implications of forced professional retirement.

In clinical medicine it has long been known that the chief hazard in prolonged convalescence from any disabling disease is the psychological deterioration that invariably develops; indeed, this profound depressive mood may outlast the original physical syndrome by many months and sometimes years. In certain instances the psychosomatic impact may result in greater scarring than the initial disease process. This is particularly true among individuals primarily engaged in the creative arts, science, and research medicine; strangely enough, in the world of sports where it might be expected that physical disability would produce considerable psychosomatic impact, there appears to be less reaction. Forced academic retirement at the age of 65 (some institutions retire their operating surgeons at 62) finds many medical men at the very peak of their professional careers; although *status emeritus* carries certain consulting privileges in hospitals and medical schools, the abrupt transition from a very exciting and active type of existence to one of relative boredom presents a critical period for most physicians. Loss of intimate contact with younger individuals, the absence of a teaching stimulus, the disappearance of the prestige factor—all produce an emotiopsychic reaction similar to that seen as a developmental part of physical disability, perhaps to a greater degree.

Although this situation has been more or less imperfectly understood for several decades, there has been a startling increase in the number of retirement psychosomatic casualties since World War II. Many suggestions have been made to ameliorate this problem; Conrad, for example, speaks of the creation and appointment of visiting professors of research while Silverman proposes an "Emeritus House." In 1951, the Valley Forge Heart Institute and Research Center in Pennsylvania started a preliminary program for retired research scientists and physicians.

A practical approach to the problem, insofar as it touches the lives of retired physicians and surgeons, has been initiated by the Caroline Greenwood Fund for Medical Research [*N. Y. Physician* **42**, 10 (1954)]. At the 1953 annual meeting of the fund council, a publishing project to be known as "Medicine Emeritus" was organized. I have had the honor of being appointed editor in chief and will have the assistance of eight associate editors representing the various specialties. An attempt is being made to utilize the experience and know-how of a selected group of specialists now retired from active practice in a series of publications. The pilot test will be issued as *Medicine Emeritus Yearbook of 1955,* and it will contain articles on the management of chronic disabling diseases of the heart, kidneys, lungs, and gastrointestinal tract, as well as articles on arthritis, diabetes, and certain eye conditions associated with the aging process.

Although this publication will be a cooperative economic venture, its greatest contribution to the less happy aspects of *status emeritus* will be the prophylactic outlet of the psychosomatic impact of retirement. If the project is successful, it might well point the way toward similar ventures in the fields of pure science, biology, and chemistry. As an experiment in applied sociology, it warrants the attention of all scientists regardless of their present interests. As the sands of time run out, we all approach the line marked *emeritus.*

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1 November 1954.

Thorium Determinations in Manganese Nodules

A knowledge of the geochemical behavior of thorium isotopes in the sedimentary cycle is a prerequisite in using the ionium decay scheme for the measurement of the rates of accumulation of deep-sea sediments. Inasmuch as manganese nodules may reflect mainly hydrogenous precipitation processes (*1*), it was felt of interest to measure their thorium content. Previously, Matthews (*2*) reported evidence for the enrichment

Table 1. The thorium contents of manganese nodules from the Pacific Ocean.

Nodule	Latitude	Longitude	Depth (fathoms)	Thorium (ppm)
Horizon nodule	40°14′N	155°05′W	2790	124 ± 15
Cape Johnson Gyot	17°10′N	177°10′W	1055–1120	24 ± 5
Gulf of Alaska, sample 3	56°10′N	145°15′W		25 ± 2
Hess Guyot (manganese coatings on coquina shells of *Vermicularia*)	17°54′N	174°16′W	956–80	30 ± 6

of thorium in manganese nodules with respect to pelagic clays. Thorium in pelagic clays averages 5 ppm (*3*), whereas Matthews reports minimum thorium contents in three nodules of 30 to 40 ppm. Koczy (*4*) had previously observed higher values of thorium in the nodules than in clays with lower absolute values in both cases.

The following method was employed. Complete dissolution of approximately 1 g of the sample is accomplished by HCl-$HClO_4$, followed by a HF dissolution of the silica residue and a sodium carbonate fusion of any remaining solids. Thorium-234 is added to the combined solutions as a tracer for the determination of the yield. The thorium is then coprecipitated with $Fe(OH)_3$ upon addition of gaseous ammonia. The precipitate is dissolved in HF, and lanthanum carrier is added to precipitate LaF_3, which coprecipitates the thorium. This step is repeated to insure a complete separation of thorium from zirconium. The precipitate is dissolved in an aluminum nitrate-nitric acid solution, and the thorium is extracted into mesityl oxide (*5*). The thorium is stripped into water and extracted into a 2-thenoyltrifluoro acetone (TTA)-benzene mixture (*6*). The residue is then taken up in HCl and measured colorimetrically as the "thoron" complex of thorium (*7*).

The yields varied between 50 and 80 percent. Blank values on the reagents were less than 0.1 μg of thorium. The main interference in the colorimetric method comes from zirconium. Spectrographic analyses on the final residue from the TTA-benzene extraction revealed that the zirconium concentrations were below interfering levels.

The analyses of a number of Pacific Ocean manganese nodules are given in Table 1. Thorium is concentrated in manganese nodules by factors exceeding 5 over deep-sea sediments. This elemental enrichment of thorium closely parallels manganese. Such a result is not unexpected, since other elements, probably existing as cations in sea water, such as nickel, copper, and lead, show a similar behavior (*1, 8*). The unusually high thorium content of the Horizon nodule is anomalous. The thorium was not enriched either in the acid-insoluble residue or in the zeolite phases that form the core of the nodule and often accompany the manganese phases.

These preliminary results (*9*) lend support to the ionium-thorium method for the determination of the rates of accumulation of deep-sea sediments (*3*), since one of the major assumptions of this method is that ionium and thorium in the sediments are accumulated from sea water as opposed to volcanic or terrestrial sources.

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16 February 1955.

H. G. Wells Predicts

H. G. Wells scores again! From *The Fate of Man* (Longmans, Green, New York, 1939), p. 13:

> It is conceivable that the scientific worker is even now walking into a net; that increasing areas of his inquiries and experiments are falling under the restrictions of "official secrets" and that far beyond the more obvious realms of physics and chemistry, fields of investigation having no direct bearing upon warfare are likely to come under control.

We ain't seen nothin' yet!

BRUCE STEWART

1016 Ohio, Lawrence, Kansas

14 March 1955.

ELEMENTS OF ATOMIC PHYSICS

by DAVID C. PEASLEE, Dept. of Physics, Purdue University

This is a basic text for courses in Atomic Physics or Atomic Structure, and excellent reference for courses in Atomic Spectra or Properties of Matter. The text starts with the classical picture of atoms as hard spheres; emphasizes experimental results and their theoretical interpretations and concludes with a fully developed quantum mechanical model of the atom. Inductive logical order is followed throughout (i.e., black body radiation is discussed in the final chapter as an application of wave mechanics, and the Bohr-Sommerfield atomic model is mentioned only briefly.) It achieves unusual continuity and unity by treating atomic physics as a single closed subject that is not developing per se. The book is designed to form a bridge in the student's training between the classical introductory courses and more advanced modern topics.

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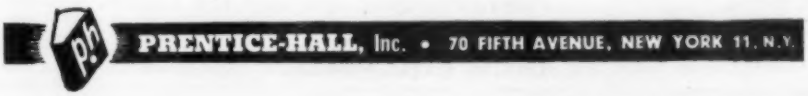

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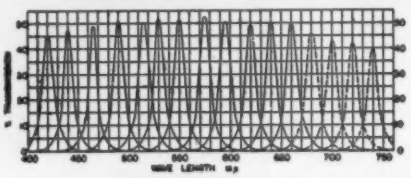

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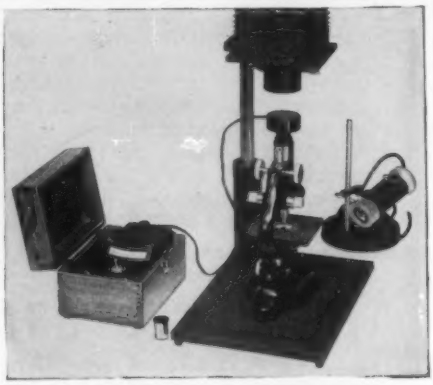

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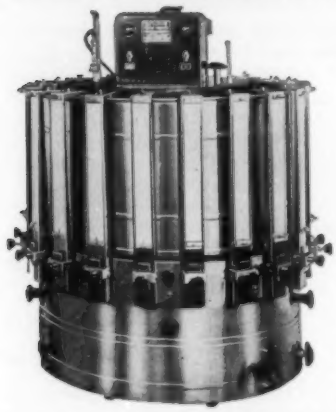

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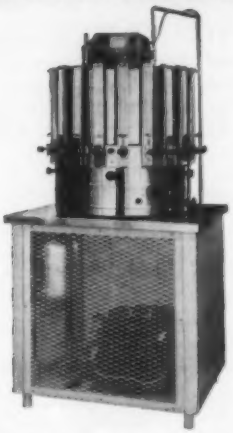

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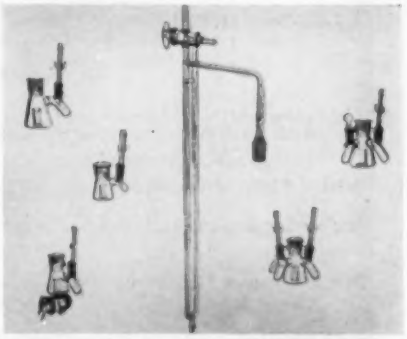

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FLUORIDATION AS A PUBLIC HEALTH MEASURE

Editor: James H. Shaw, Harvard School of Dental Medicine

6 x 9 inches, 240 pages, 24 illustrations, index, clothbound, 1954

Price $4.50. AAAS Members' prepaid order price $4.00.

A symposium volume of the American Association for the Advancement of Science

The fluoridation of water supplies has become a subject of intense national interest. This volume offers a comprehensive evaluation of our present knowledge of the benefits and possible dangers of fluoride ingestion and the importance of fluoridation in dental caries and human health. Both scientific research and engineering implementation are covered.

This book will prove to be an invaluable reference for the public health worker, the sanitarian, the civic official, the waterworks engineer, and the interested layman. The eminent qualifications of each of the chapter authors should be sufficient to inspire confidence in the unbiased authenticity of the material.

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Metabolism of Inorganic Fluorides	Edward J. Largent, University of Cincinnati
Some Public Health Aspects of Water Fluoridation	Harold C. Hodge and Frank A. Smith, University of Rochester
Medical Aspects of Excessive Fluoride in a Water Supply: A Ten-Year Study	N. C. Leone, F. A. Arnold, Jr., E. R. Zimmerman and P. B. Geiser, National Institute of Dental Research, National Institutes of Health; J. E. Lieberman, Office of Biometry, National Institutes of Health; M. B. Shimkin, National Cancer Institute, National Institutes of Health; and C. A. Stevenson, Scott and White Clinic, Temple, Texas
A Long-Term Medical Study of Children in a Community with a Fluoridated Water Supply	Edward R. Schlesinger, New York State Department of Health and Union University; David E. Overton and Helen C. Chase, Newburgh-Kingston Fluoridation Survey Project
The External Action of Fluorides and Other Agents on the Teeth in the Prevention of Tooth Decay	Basil G. Bibby, Eastman Dental Dispensary and University of Rochester, and Finn Brudevold, Eastman Dental Dispensary, Rochester, New York
Relative Merits of Various Fluoridation Vehicles	Reidar F. Sognnaes, Harvard University
Engineering Aspects of Fluoridation Installation	O. J. Muegge, Wisconsin State Board of Health, Madison, Wisconsin
Determination of Fluorides in Water	James G. Weart, Department of Public Health of the State of Illinois, Springfield, Illinois
Some Chemical Aspects of Water Fluoridation	M. Starr Nichols, University of Wisconsin and State Laboratory of Hygiene, Madison, Wisconsin

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The Mind Prepared

This editorial occasioned by the death of Sir Alexander Fleming appeared in the London Times *on 12 March 1955 and is reprinted here with permission.*

EVEN before his death the name of Sir Alexander Fleming had been entered with those of Jenner, Pasteur and Lister in the proud roll of men who have been "eternis'd for some wondrous cure." The story of the discovery and development of penicillin is already a classic of science: how one day in the laboratories of St. Mary's Hospital "a stray mold spore implanted itself on a microbic culture where it was not wanted"; how Fleming digressed from his research into the staphylococcus to observe the action of the mold, to cultivate it and to explore its antibacterial properties; how the problem of extracting a concentration sufficient for clinical purposes was taken up again 10 years later at Oxford and solved; how its first clinical success was at the time of Germany's heaviest aerial bombardment of Britain; how its large-scale commercial manufacture was undertaken in the United States, and how it became available in quantity in the latter part of the war.

However closely the methodology of science is studied no prescription will be found for discovery. It is not made by rule of thumb. The story of penicillin well illustrates two complementary phases of scientific research. There was the concentrated attack by Sir Howard Florey and his associates at Oxford on a single predefined problem—the extraction of a pure and stable form of penicillin. But this was preceded by the almost accidental discovery of the properties of this mold by Fleming when he was engaged on other work. It was a long chance that a spore of that particular mold should float into St. Mary's laboratory and settle on a culture plate. When laden with honors toward the end of his life, he used to emphasize this element of chance at the expense of his own contribution. But, as Pasteur truly noted, in the field of observation chance favors only the mind that is prepared. Instead of passing it over as a spoiled plate, Fleming seized upon it, studied it, and justly appreciated the novelty of its effects.

Fleming used to draw another moral from the tale: that it illustrated the value of freedom to pursue research. He was able to relax his attention to the project in hand in order to pursue an unexpected and unexplained phenomenon which was a by-product of it. It might have been a blind alley—it almost was; but it is from the freedom and readiness of scientists to explore blind alleys that discovery often comes. Genius is the prime mover; and genius brooks no direction.

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Meetings & Conferences

May

22–26. Air Pollution Control Assoc. 47th annual, Detroit, Mich. (Harry C. Ballman, 4400 Fifth Ave., Pittsburgh 13, Pa.)

23–25. American Trudeau Soc., Milwaukee, Wis. (Natl. Tuberculosis Assoc., 1790 Broadway, New York 19.)

23–26. International Surgical Cong., Geneva. (M. Thorek, 1516 Lake Shore Dr., Chicago, Ill.)

23–27. National Tuberculosis Assoc., annual, Milwaukee, Wis. (NTA, 1790 Broadway, New York 19, N.Y.)

26–27. American Statistical Assoc., Section on Physical and Engineering Sciences, New York, N.Y. (Jack Moshman, Bell Telephone Laboratories, Inc., Murray Hill, N.J.)

26–31. International Cong. of Comparative Pathology, Lausanne, Switzerland. (Prof. Hauduroy, 19 rue Cesar Roux Lausanne.)

30–1. Chemical Inst. of Canada, Quebec. (Donlad W. Emmerson, CIC, 18 Rideau St., Ottawa 2.)

30–3. International Hospital Federation, 9th cong., Lucerne, Switzerland. (J. E. Stone, 10 Old Jewry, London, E.C. 2, England.)

June

1–4. Alaskan Science Conf., 6th, College, Alaska. (Arthur S. Buswell, Box B, College.)

2–4. National Soc. of Professional Engineers, annual, Philadelphia, Pa. (K. E. Trombley, NSPE, 1121 15 St., NW, Washington 5.)

3–4. American Rheumatism Assoc., annual, Atlantic City. (W. H. Kammerer, 33 E. 61 St., New York 21.)

4–5. Soc. for Investigative Dermatology, annual, Atlantic City, N.J. (H. Beerman, 255 S 17 St., Philadelphia 3, Pa.)

5–10. American Soc. of Mechanical Engineers, Oil and Gas Power Conf., Washington, D.C. (C. E. Davies, ASME, 29 W. 39 St., New York 18, N.Y.)

5–11 Industrial Microbiology Inst., 8th annual, Lafayette, Ind. (C. L. Porter, Dept. of Biological Sciences, Purdue Univ., Lafayette, Ind.)

6–10. American Medical Assoc., annual, Atlantic City, N.J. (G. F. Lull, 535 Dearborn St., Chicago 10, Ill.)

6–10. Industrial Research Conference, 6th annual, Harriman, N.Y. (R. T. Livingston, 409 Engineering, Columbia University, New York 27.)

6–15. World Petroleum Congress, 4th, Rome, Italy. (General Organizing Committee, 4th WPC, Via Tevere 20, Rome.)

7. National Assoc. of Science Writers, annual, Atlantic City, N.J. (Rosamond R. Blakeslee, NASW, 5 Longview Rd., Port Washington, N.Y.)

8–10. American Meteorological Soc., Kansas City, Mo. (K. C. Spengler, AMS, 3 Joy St., Boston 8, Mass.)

8–18. International Organization for Standardization, Stockholm, Sweden. (American Standards Assoc., 70 E. 45th St., New York 17, N.Y.)

8–24. Joint Metallurgical Societies Meeting in Europe—London, Dusseldorf, and Paris. (W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.)

9–10. Carbon Conference, Univ. of Buffalo, Buffalo, N.Y. (Carbon Conference, Dept. of Physics, Univ. of Buffalo, Buffalo.)

9–21. Colloquium on Theoretical Physics, Ottawa, Canada. (T. Y. Wu, Div. of Physics, National Research Council, Ottawa 2.)

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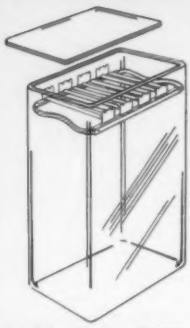

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Meetings & Conferences

June, ***contd.***

10–12. American Electroencephalographic Soc., 9th annual, Chicago, Ill. (W. T. Liberson, Veterans Admin. Hospital, Northampton, Mass.)

12–15. American Soc. of Agricultural Engineers, 48th annual, Urbana, Ill. (F. B. Lanham, ASAE, St. Joseph, Mich.)

12–16. Special Libraries Assoc., Detroit, Mich. (M. E. Lusius, 31 E. 10 St., New York 3.)

13–15. American Neurological Assoc., 80th annual, Chicago, Ill. (H. H. Merritt, Neurological Inst., 710 W. 168 St., New York 32.)

13–16. National Organic Chemistry Symposium, 14th, Lafayette, Ind. (W. E. Parham, 347 Chemistry, Univ. of Minnesota, Minneapolis 14.)

13–17. American Soc. of Civil Engineers, St. Louis, Mo. (W. N. Carey, ASCE, 33 W. 39 St., New York 18.)

13–17. Symposium on Molecular Structure and Spectroscopy, annual, Columbus, Ohio. (H. H. Nielsen, Ohio State Univ., Columbus 10.)

13–22. International Commission on Illumination, plenary meeting, Zurich, Switzerland. (C. A. Atherton, International Commission, Hopkinton, N.H.)

14–16. Conf. and Exhibit on Magnetics, Pittsburgh, Pa. (R. Rimbach, 845 Ridge Ave., Pittsburgh 12.)

15–17. Brookhaven Symposium in Biology No. 8, annual summer conf., Upton, L.I., N.Y. (R. C. King, Dept. of Biology, Brookhaven Natl. Lab., Upton.)

15–17. Joint Conf. on Combustion, American and British, Boston, Mass. (American Soc. of Mechanical Engineers, 29 W. 39 St., New York 18.)

15–18. Colloquium of College Physicists, annual, Iowa City, Ia. (G. W. Stewart, Dept. of Physics, State Univ. of Iowa, Iowa City.)

16–18. Symposium on Microscopy, sixth, Chicago, Ill. (W. C. McCrone, Armour Research Foundation, Technology Center, Chicago 16.)

17–19. Soc. of Nuclear Medicine, Portland, Ore. (A. Livermore, Reed College, Portland.)

20–23. American Soc. of Mechanical Engineers, semiannual meeting, Boston, Mass. (O. B. Schier, 29 W. 39 St., New York 18, N.Y.)

20–24. American Assoc. of Physics Teachers, joint meeting with American Soc. for Engineering Education, State College, Pa. (M. W. White, Pennsylvania State Univ., State College.)

20–24. British Medical Assoc. annual, Toronto, Ontario. (A. D. Kelly, Canadian Medical Assoc., 244 St. George St., Toronto 5.)

20–25. AAAS, Pacific Div., Pasadena, Calif. (A. W. Galston, Biology Div., California Inst. Technology, Pasadena 4.)

20–25. Symposium on Electromagnetic Wave Theory, Ann Arbor, Mich. (J. W. Crispin, Jr., Univ. of Michigan, Ypsilanti.)

21–23. American Dairy Science Assoc., East Lansing, Mich. (E. Weaver, Dairy Dept. Michigan State College, East Lansing.)

21–23. American Meteorological Soc., Pasadena, Calif. (K. C. Spengler, AMS, 3 Joy St., Boston 8, Mass.)

22–24. American Physical Soc., Toronto, Canada. (K. K. Darrow, APS, Columbia Univ., New York 27, N.Y.)

24–2. International Statistical Inst., 29th annual, Rio de Janeiro, Brazil. (ISI, 2 Oostduinlaan, The Hague, Netherlands.)

Meetings & Conferences

June, ***contd.***

26–1. American Soc. for Testing Materials, annual, Atlantic City, N.J. (R. J. Painter, 1916 Race St., Philadelphia 3, Pa.)

26–1. National Education Assoc., Chicago, Ill. (W. G. Carr, 1201 16 St., NW, Washington 6, D.C.)

27–29. American Nuclear Society, 1st annual, University Park, Pa. (W. W. Miller, Pennsylvania State Univ., University Park.)

27–29. American Soc. for Engineering Education, University Park, Pa. (W. E. Ranz, Dept. of Engineering Research, Pennsylvania State Univ., University Park.)

27–1. American Crystallographic Assoc., California Inst. of Technology, Pasadena.

27–1. American Inst. of Electrical Engineers, summer general, Swampscott, Mass. (N. S. Hibshem, AIEE, 33 W. 39 St., New York 18, N.Y.)

27–1. Assoc. of Official Seed Analysts, Stillwater, Okla. (R. G. Colborn, Seed Lab., Dept. of Agriculture, Lincoln, Neb.)

28–1. American Home Economics Assoc., annual, Minneapolis, Minn. (G. H. Johnson, 114 E. Park Pl., Newark, Del.)

28–9. British Instrument Industries' Exhibition, 3rd annual, London. (F. W. Bridges & Sons Ltd., Grand Bldgs., Trafalgar Sq., London W.C. 2.)

28–9. International Electrotechnical Commission, London, England. (American Standards Assoc., 70 E. 45 St., New York 17, N.Y.)

30–2. Acoustical Soc. of America, State College, Pa. (W. Waterfall, ASA, 57 E. 55 St., New York 22, N. Y.)

July

2–4. Astronomical League, Seattle, Wash. (G. C. Scholz, 166 Mason Hall Apts., Alexandria, Va.)

3–9. American Library Assoc., annual, Philadelphia, Pa. (D. H. Clift, 50 E. Huron St., Chicago 11, Ill.)

4–8. International Diabetes Federation, Cambridge, Eng. (IDF, 152 Harley St., London, W.1.)

13–17. International Seaweed Symposium, 2nd, Trondheim, Norway. (ISS, c/o T. Braarud, Blindern, Oslo.)

15–22. Assoc. Française pour l'Avancement des Sciences, Caen, France. (Mlle. Henri-Martin, Secrétaire, 28 rue Serpente, Paris 6e.)

18. International Water Supply Cong., 3rd, London, Eng. (L. Millis, 34 Park St., London, W.1.)

18–23. International Assoc. of Applied Psychology, London, Eng. (C. B. Frisby, National Inst. of Industrial Psychology, 14 Welbeck St., London, W.1.)

20–28. International Union of Pure and Applied Chemistry, Zurich, Switzerland. (R. Morf, Sec. Gen., IUPAC, Zurich 1.)

25–30. Internationnl Anatomical Cong., Paris, France. (G. Cordier, 3 Square Albani, Paris 16e.)

28–30. Colloquium on Biochemical Problems of Lipids, 2nd, Univ. of Ghent, Belgium. (R. Ruyssen, St. Jansvest 12, University of Ghent, Belgium.)

August

1–5. International Cong. of Plastic Surgery, Stockholm and Uppsala, Sweden. (J. F. Larsen, 12, Kristianiagade, Copenhagen Ø, Denmark.)

1–6. International Cong. of Biochemistry, Brussels, Belgium. (C. Liebecq, 17 Place Delcour, Liége, Belgium.)

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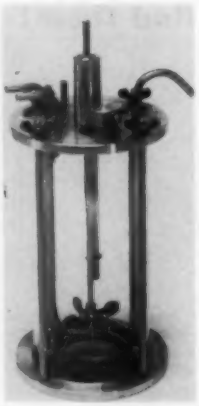

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Meetings & Conferences

August, ***contd.***

15–18. American Veterinary Medical Assoc., Minneapolis, Minn. (J. G. Hardenbergh, 600 S. Michigan Ave., Chicago 5, Ill.)

15–19. American Institute of Electrical Engineers, Pacific general, Butte, Mont. (N. S. Hibshem, 33 W. 39 St., New York 18.)

15–19. American Soc. of Agronomy and the Soil Science Soc. of America, joint meeting, Davis, Calif. (L. G. Monthey, 2702 Monroe St., Madison 5, Wis.)

17–24. Australian and New Zealand Assoc. for the Advancement of Science, 31st, Melbourne, Australia. (J. R. A. McMillan, ANZAAS, Science House, 157 Gloucester St., Sydney, N.S.W., Australia.)

22–23. Electronics and Automatic Production Symposium, San Francisco, Calif. (Wm. D. McGuigan, Stanford Research Inst., Palo Alto.)

29–30. Mathematical Assoc. of America, Ann Arbor, Mich. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

29–2. International Assoc. for Hydraulic Research, 6th plenary, Delft, Netherlands. (L. G. Straub, St. Anthony Falls Hydraulic Lab., Minneapolis 14, Minn., or J. Th. Thijsse, IAHR, Raam 61, Delft.)

29–6. International Horticultural Cong., 14th, The Hague, Netherlands. (G. de Bakker, International Comm. for Horticulture, Bezuidenhoutseweg 30, The Hague.)

30–2. American Mathematical Soc., 60th summer, Ann Arbor, Mich. (AMS, 80 Waterman St. Providence 6, R.I.)

31–1. Conf. on Low Temperature Physics, Paris, France. (L. Weil, Institut Fourier, Place du Doyen Gosse, Grenoble, Isère, France.)

31–2. American Sociological Society, Washington, D.C. (W. J. Warner, ASS, New York Univ., Washington Sq., New York 3, N.Y.)

31–3. United Chapters of Phi Beta Kappa, 24th triennial, Minneapolis, Minn. (C. Billman, 1811 Q St., NW, Washington 9, D.C.)

31–8. International Cong. of Refrigeration, Paris, France. (L. Weil, Institut Fourier, Place du Doyen Gosse, Grenoble, Isère, France.)

September

2–7. American Psychological Association, San Francisco, Calif. (F. H. Sanford, APA, 1333 16 St., NW, Washington 6, D.C.)

2–7. Psychometric Society, San Francisco, Calif. (J. B. Carroll, Harvard Univ., 13 Kirkland St., Cambridge 38, Mass.)

4–7. International Congress of Vitamin E, 3rd, Venice, Italy. (K. E. Mason, Dept. of Anatomy, Univ. of Rochester School of Medicine and Dentistry, 260 Crittenden Blvd., Rochester 20, N.Y.)

5–6. American Political Science Association, Boulder, Colo. (H. C. Mansfield, Dept. of Political Science, Ohio State Univ. Columbus, Ohio.)

5–9. American Inst. of Biological Sciences, Michigan State College, East Lansing, Mich. (H. T. Cox, AIBS, 2000 P St., NW, Washington 6, D.C.)

The following 20 meetings are being held jointly with the AIBS at East Lansing, Mich.

American Bryological Soc., E. Lansing, Mich. (L. J. Gier, Dept. of Biology, Wm. Jewell College, Liberty, Mo.)

Meetings & Conferences

September, ***contd.***

American Fern Soc., East Lansing, Mich. (M. E. Faust, 501 University Pl., Syracuse 10, N.Y.)

American Microscopical Soc., East Lansing, Mich. (C. J. D. Brown, Dept. of Zoology and Entomology, Montana State College, Bozeman, Mont.)

American Society for Horticultural Science, East Lansing, Mich. (F. S. Howlett, Ohio Agr. Experimental Sta., Wooster.)

American Soc. of Human Genetics, East Lansing, Mich. (D. C. Rife, Ohio State Univ., Columbus, Ohio.)

American Soc. of Limnology and Oceanography, East Lansing, Mich. (B. H. Ketchum, Woods Hole Oceanographic Inst., Woods Hole, Mass.)

American Society of Naturalists, East Lansing, Mich. (W. P. Spencer, 22F33 (F), Dept. of Genetics, Univ. of Texas, Austin 12.)

American Soc. of Plant Physiologists, East Lansing, Mich. (J. F. Stanfield, Dept. of Botany, Miami Univ., Oxford, Ohio.)

American Soc. of Plant Taxonomists, East Lansing, Mich. (R. C. Rollins, Gray Herbarium, Harvard Univ., 22 Divinity Ave., Cambridge 38, Mass.)

American Soc. of Zoologists, East Lansing, Mich. (R. C. Kempton, Dept. of Zoology, Vassar College, Poughkeepsie, N.Y.)

Biometric Soc., East Lansing, Mich. (C. I. Bliss, Box 1106, New Haven 4, Conn.)

Botanical Society of America, Michigan State College, (H. C. Bold, Dept. of Biology, Vanderbilt Univ., Nashville, Tenn.)

Ecological Soc. of America, East Lansing, Mich. (J. F. Reed, Dept. of Botany, Univ. of Wyoming, Laramie.)

Genetics Soc. of America, East Lansing, Mich. (C. P. Oliver, Dept. of Zoology, Univ. of Texas, Austin.)

Mycological Soc. of America, East Lansing, Mich. (E. S. Beneke, Botany and Plant Pathology Dept., Michigan State College, East Lansing.)

Phycological Soc., East Lansing, Mich. (P. C. Silva, Dept. of Botany, Univ. of Illinois, Urbana.)

Potato Assoc. of America, East Lansing, Mich. (R. W. Hougas, Dept. of Genetics, Univ. of Wisconsin, Madison 6.)

Society for Industrial Microbiology, East Lansing, Mich. (C. L. Porter, Dept. of Biological Sciences, Purdue Univ., West Lafayette, Ind.)

Society of Protozoologists, East Lansing, Mich. (N. D. Levine, College of Veterinary Medicine, Univ. of Illinois, Urbana, Ill.)

Soc. for the Study of Evolution, East Lansing, Mich. (Harlan Lewis, Dept. of Botany, Univ. of California, Los Angeles 24.)

5–10. World Cong. of Anaesthesiologists, Scheveningen, Netherlands. (W. A. Fentener van Vlissingen, WCA, Bilthoven, Netherlands.)

6–11. American Physiological Soc., Boston, Mass. (M. O. Lee, APS, 9650 Wisconsin Ave., Washington 14, D.C.)

11–16. Laurentian Hormone Conf. AAAS, annual, Estes Park, Colo. (Committee on Arrangements, 222 Maple Ave., Shrewsbury, Mass.)

11–16. Sigma Delta Epsilon, Minneapolis, Minn. (Mary Fojdies, Barat College, Lake Forest, Ill.)

12–16. Illuminating Engineering Soc., annual, Cleveland, Ohio. (A. D. Hinckley, 1860 Broadway, New York 23, N.Y.)

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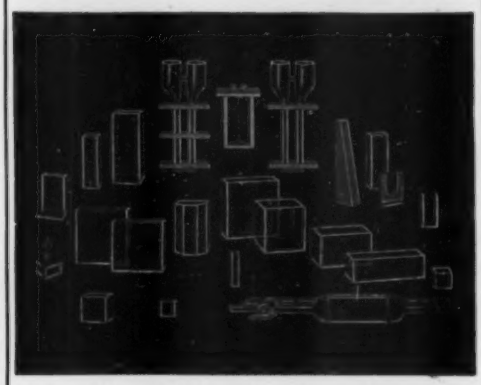

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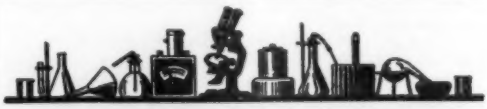

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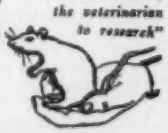

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Sex in Microorganisms

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The genetic, physiological, and morphological evidence for "sex" in the principal groups of microorganisms—viruses, bacteria, fungi, unicellular algae, and protozoa—is presented by a group of experts in the field.

N. Visconti of the Carnegie Institution of Washington at Cold Spring Harbor, discusses recombination of "genes" in viruses. J. Lederberg of Wisconsin and E. L. Tatum of Stanford review genetic evidence for "sex" in bacteria, and W. G. Hutchinson of Pennsylvania and H. Stempen of Jefferson Medical College describe cell fusions in certain bacteria. J. R. Raper offers a comprehensive coverage of sex in fungi.

R. Patrick of the Academy of Natural Sciences, Philadelphia, describes syngamy in diatoms; R. A. Lewin of the Maritime Regional Laboratory, Halifax, the sexuality of other unicellular algae, especially the flagellates.

In two chapters D. H. Wenrich covers sexual phenomena in some of the protozoa and discusses the origin and evolution of sex, based primarily on the protozoa, but including material about all of the microorganisms. D. L. Nanney of Michigan summarizes mating-type phenomena in *Paramecium aurelia* and some of the recent mating-type work from Sonneborn's laboratory. C. B. Metz of Florida State compares mating-type substances in *Paramecium* and other ciliates with those found in Metazoa. Extensive chapter bibliographies are included.

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